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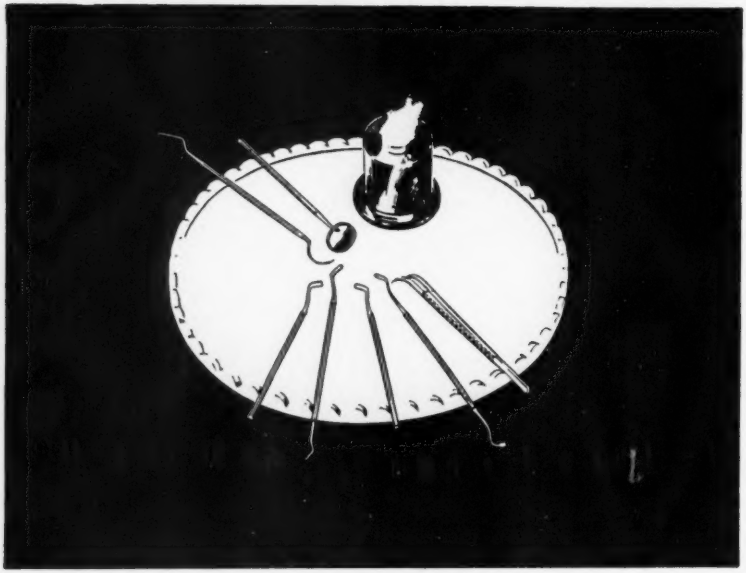

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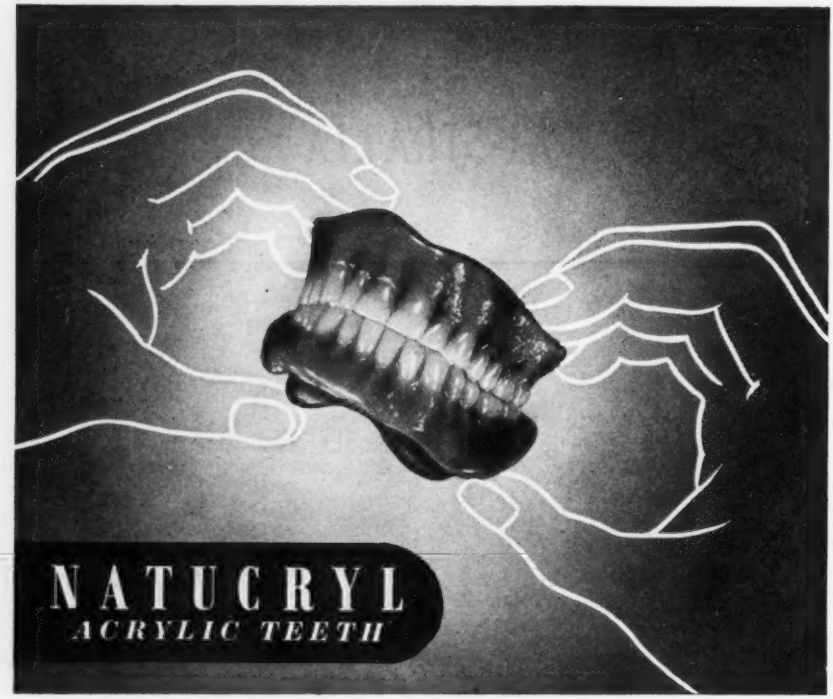

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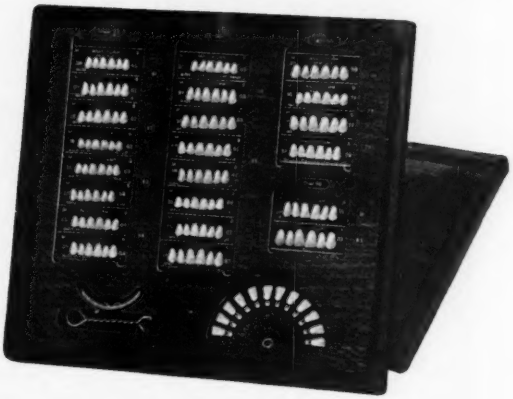

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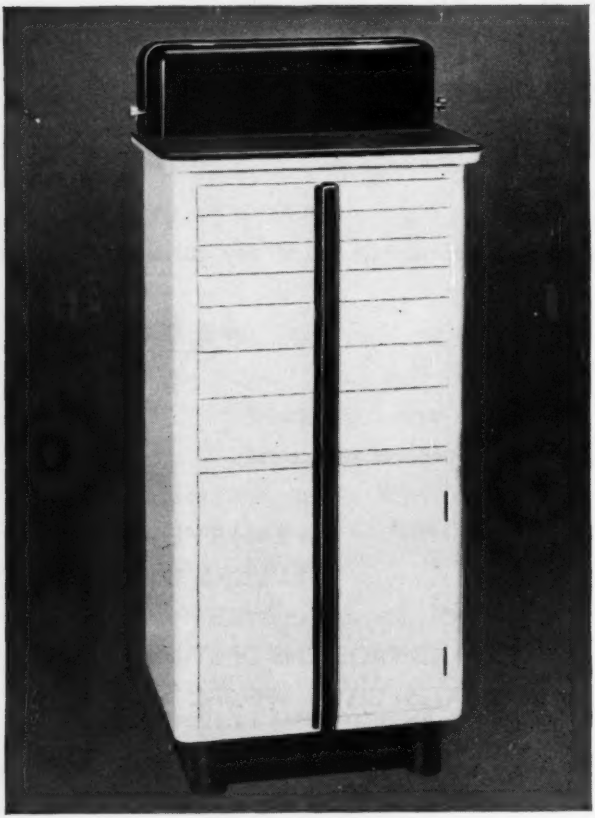

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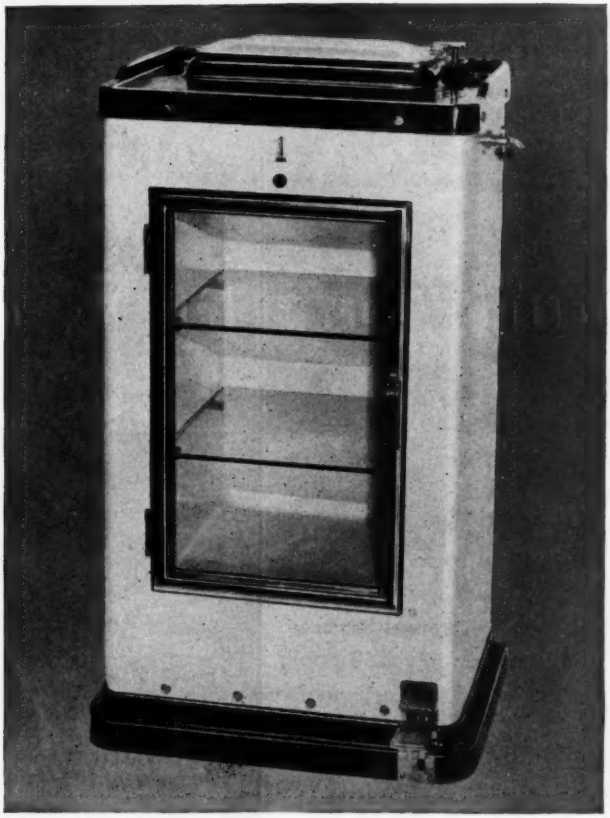

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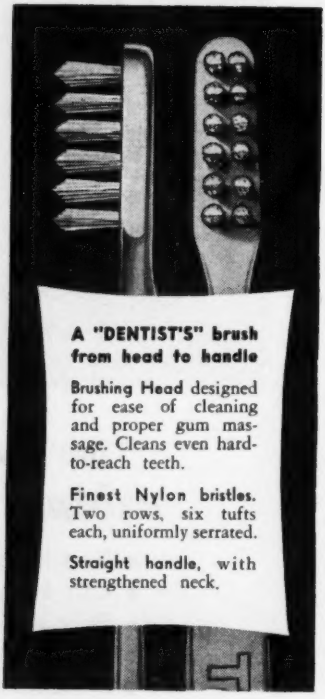

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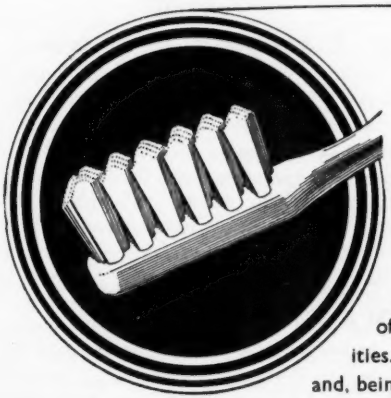

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The DENTAL Journal OF AUSTRALIA

Vol. 22 May, 1950 No. 5

A PSYCHO-SOMATIC STUDY INTO THE NATURE, PREVENTION AND TREATMENT OF THUMB-SUCKING AND ITS RELATIONSHIP TO DENTAL DEFORMITY.*

A. G. H. LAWES, D.D.Sc.

PART II.

10. CATTLE BEHAVIOUR.

A. OBSERVATIONS CARRIED OUT AT THE MCGARVIE SMITH ANIMAL HUSBANDRY FARM, FACULTY OF VETERINARY SCIENCE, UNIVERSITY OF SYDNEY. JAN. 1947.

For the purposes of studying parallel behaviour, cattle are extremely useful because their normal suckling time of 9-10 months is much the same as that of the human infant. Cattle can be divided broadly into two groups—dairy cattle and beef cattle, and the techniques of rearing them are quite different. With dairy cattle, calves are usually weaned from their mothers within 48 hours after birth, whereas calves of beef cattle remain with their mothers and suckle naturally for about 9 months.

The Jersey herd at the McGarvie Smith Farm provided an excellent opportunity for observations of behaviour. The feeding of two different groups of calves was observed, and provided an interesting contrast. One group consisted of three calves aged three weeks, two of whom were twins. These three were chained up out of reach of each other just before feeding. A bucket containing a measured ration of milk was given to each one and this was very quickly consumed. Immediately one calf had finished its milk it seized upon a finger of an attendant standing nearby and sucked it voraciously and, as a demonstration, two of the calves were then unchained. They immediately approached each other and, seizing upon one another's lips, sucked at them for several minutes. Although they were forcibly separated and chained up out of reach, they continued straining to get at each other for quite some time. Because of this behaviour it is always necessary to leave them chained apart for one hour after giving them their milk, in order to prevent this fierce substitute sucking. Dry feed is available to them immediately after their

*Portion of the thesis presented in fulfilment of the requirements for the degree of Doctor of Dental Science, University of Sydney. Degree conferred October 10, 1949.

milk and at the end of an hour the calves can be released, as they will have temporarily forgotten their sucking urge by then.

The feeding of the other group of four calves provides a marked contrast. Two cows on the farm are quite good milkers but have dropped udders which make them unsuitable for milking by machine. They have, therefore, been used for some time past as nurse cows for some of the new-born calves. This is a chance circumstance which provides a contrast to the normal dairy practice of weaning calves at birth. Instead of being bucket-fed from birth, four calves are being fed naturally by these two cows, each cow feeding two calves at a time. The calves do not remain with the nurse cows all day but at feeding time the cows are given their own bins of food and the calves are allowed access to them. On this particular occasion it was noticed that the calves suckled quite contentedly until the milk supply was nearly exhausted, when a certain amount of jostling took place for access to the teats providing the last drops of milk. One calf ceased suckling and helped itself to some of the cow's food from the bin, but very soon desisted and lay down nearby and went to sleep. The other calf of this pair suckled for some minutes longer, then it, too, lay down. These calves showed no further interest in one another. No chaining or separating was necessary and there was not the slightest tendency to suck one another.

The two calves with the other nurse cow fed in a very similar manner but, when they finished, they walked away together for 25 yards or so. One calf made some desultory attempts to suck its mate, who showed no interest whatever in retaliating. It very soon lay down and the first calf then ceased its sucking overtures, and it, too, lay down nearby and went to sleep. It was estimated that the suckling calves took about three times as long to obtain their milk as did the calves who got theirs from buckets. The contrast in demeanour between the bucket-fed and the naturally-fed calves after feeding was most striking, for the former were lively and excited whilst the suckling calves appeared quiet, contented and sleepy. It is claimed that the requirements of nutrition are satisfied with both groups and that successive weekly weighing substantiates this.

These observations relating to bucket-fed and naturally-fed calves are fully supported in a report on the result of some experiments carried out in the U.S.A. S. D. Johnson[19] describes an investigation which was started in a pure-bred Guernsey herd of 200 milking cows in December, 1943. About twenty cows are selected each year, because of age, sore feet, low production, sterility and udder trouble, for nurse cows. The cows and calves are kept in open sheds of different sizes and the pens, which are 15 to 25 feet long and 11 to 25 feet wide, house two cows and three or four calves. Four-day-old calves are placed in the pens at any time of the year. When a new calf is put on a nurse cow it is allowed 10 pounds of milk per day, and within two weeks many of the calves are eating some grain and hay. It is claimed that this system greatly reduces the mortality rate, and the calves are vigorous and well-grown when they are weaned at four months. He goes on to say "they show no desire to nurse each other's udders and teats when they are in the pens. It is interesting to learn that the owner has seen only one of these heifers nursing another heifer during the past three years in the pasture. During the grazing season it was common

19. Johnson, S. D.—Raising heifer calves on mastitis milk, J.Amer.Vet. Medical Assoc., 110:179, March, 1947.

to find the heifers which had been pail-fed nursing themselves and other animals, thus necessitating special housing at the barn."

In the case of calves, as with human beings, the need for nourishment stimulates the sucking instinct. The calves fed by the nurse cow have their sucking-feeding instinct completely satisfied because not only are their nutritional requirements met, but their physical and emotional demands associated with the sucking act are met also.

The bucket-fed calves have their nutritional requirements satisfied but the instinctive act of sucking, which is so strongly stimulated, first by hunger and then by the taking of food, is completely denied.

The satisfaction of the sucking-feeding instinct is a many-sided process and the sucking act is an integral part of this process. If its satisfaction is denied, then a substitute will be found, if at all possible.

There seems to be a close similarity in this after-feeding substitute sucking on the part of the calves to the after-feeding thumb-sucking of some human infants. They might be getting enough food and be putting on weight normally but, if their milk is obtained too quickly and easily, either from the breast or feeding bottle, the demand for a certain measure of sucking activity, deriving its energy from an awakened instinct, remains unsatisfied and the thumb is turned to as a substitute. Undoubtedly, there are other requirements to be met, particularly with the human infant, but the demands for nourishment and for the full exercise of the sucking act are two that are essential.

Geddes[20] has written up these earlier observations of mine from the dairyman's point of view and has drawn attention to the behaviour of the two young calves which were seen to suck one another so furiously. Referring to my visit to the McGarvie Smith Farm, he says: "We have for some time made a habit of chaining up our calves after feeding them with milk from a bucket . . . . . but, on the occasion of the dentist's visit, we let the calves go free as soon as they had finished their milk. Although they had been regularly chained before feeding and had had little previous opportunity to suck each other, they immediately began to do so."

This situation is somewhat similar to that of the young child whose mother told me that she had bandaged his elbows every night for six months in an effort to correct his thumb-sucking. One night after this six months' period, his bandages became loose and the thumb-sucking was resumed immediately.

The situation is similar, also, to that reported later, in which one of the calves at Lone Pine Farm had been bucket-fed from birth, but lived alone in a paddock until four months old. Immediately it was placed with other calves, it started substitute sucking for the first time.

In neither case did physical restraint contribute anything to the correction of the practice and this is entirely consistent with the way in which an instinct operates. It will be recalled that an instinctive urge, once aroused, will continue until satisfied, or will strive after satisfaction until the individual is exhausted, or it will cease to operate when a strongly incompatible tendency is aroused.

The sucking-feeding instinct is always strongly aroused by the taking of food. Chaining the calves up, therefore, does nothing to alter the intensity of

20. Geddes, H. J.—Sucking vice is result of primitive urge, and Nipple feeding of calves, Primary Producer, 25:18, 1948; and 25:19, 1948.

the urge for, immediately the chains are removed after feeding, whether it is after a day or a week or a month, this instintive urge must be satisfied and substitute sucking is immediately resorted to.

In the case of the child, the bandages operated in the same way as the chains on the calves. At the same time it must be remembered that one of the characteristics of instinct (Martin[9]) is that, "if the instinctive act fails in one direction, the organism attempts a variation of activity in its response." Thus, the thumb-sucking *might* cease as the result of bandaging but it would only be because the instinct was finding satisfaction in some other allied practice which is usually more undesirable than the thumb-sucking.

The use of mittens, sticking-plaster, bitter aloes and such like restrictive measures is also doomed to failure. They are only other forms of obstruction and not only do not diminish the intensity of the instinctive urge, but actually increase it. Faced with obstruction the individual will strive all the harder for satisfaction and, consequently, mittens will be sucked or bitten through, gloves will be chewed through, aloes will be sucked off, and the thumb-sucking will go on just the same.

It has been noted that beef cattle differ from dairy cattle in that their calves are allowed to remain with their dams for nine to ten months and they can, therefore, suckle naturally whenever they like. They even differ in two respects from those dairy calves at the McGarvie Smith Farm which had been suckled by the two foster mothers, because the dairy calves were only allowed with the foster mothers twice a day at feeding time and they were suckled for only 2-3 months. One would expect, therefore, that amongst beef cattle substitute sucking would be non-existent, and such is the case.

B. LISMORE, MAY—1948.

My observations carried out at the McGarvie Smith Animal Husbandry Farm in January, 1947, the observations recorded by Johnson (*op. cit.*) in U.S.A., theoretical considerations, and information obtained from experienced cattlemen, all strongly suggested that frustration of a natural instinct lay at the bottom of the substitute sucking and that this act corresponded exactly with the thumb- and finger-sucking so frequently observed in infants. In order to obtain further evidence of this, an approach was made to Mr. G. McGillivray, Chief, Division of Dairying, Department of Agriculture in N.S.W. He at once agreed to help and, very soon, arrangements were made for me to carry out a series of observations on the properties of Mr. P. J. Carey and Mr. J. Schubring of Mallanganee, N.S.W., and at the Wollongbar Experiment Farm at Lismore, N.S.W.

Despite a temporary slackening of enthusiasm in the cause of research, owing to a cyclonic disturbance, the flight north was made on 2nd May, 1948, and the next day was spent at the Experiment Farm. This farm supports a splendid Guernsey herd and, in the rearing of calves, foster mothers are largely used. The procedure is that, whenever they are available, foster mothers are provided for all new-born calves which are allowed to run with the foster mothers and feed from them at will for a period of six weeks. At the end of six weeks the calves are taken from the foster mothers and put on to a bucket feed of 2 gallons of skim milk per day, followed by a dry feed consisting of 4-parts oats, 2-parts bran, and one part of crushed wheat. They are provided with two feeds a day and this continues from their seventh week, when they

are taken from the foster mother, till the calves are nine months old, when artificial feeding is discontinued altogether.

Fig. 6a.

Fig. 6b.

Fig. 6c.

If there are not enough foster mothers for all calves, then the normal dairy farm practice is followed for those without foster mothers and they are put on to bucket feeding 48 hours after birth. A series of observations and photographs were made in Paddock "A", in which were 8 calves aged 3-4 weeks, 5 foster mothers, 12 heifers in calf, and 5 backward cows. The 8 calves were all running with the foster mother cows and were fed by them exclusively. The pasture was ankle-deep kikuya grass and all animals were in splendid condition, presenting a picture of complete contentment. Two calves fed from one of the cows whilst we watched and took 12 minutes' steady sucking, before they were satisfied and broke away. They sauntered off together without making any attempt to suck one another and the accompanying series of photographs shows

Fig. 6d.

Fig. 6e.

Fig. 6.—Two calves are first seen approaching their foster mother "a". In "b" they are shown feeding. In "c" they have just finished and "d", "e" show them strolling away together. Not at any time during the whole feeding process was any substitute sucking resorted to.

this very clearly (Fig. 6). The calves were perfectly quiet and contented. One of these calves was a heifer and the other a bull calf, one having been born on 7th April, and the other on 8th April, 1948.

In Paddock "B" there were four calves by themselves (Fig. 7). One, aged 8 weeks, had been reared on a foster mother for 7 weeks and for one week had been bucket-fed. Another, aged 6 weeks, had been with a foster mother for one week and had been bucket-fed for five weeks. The remaining two, aged 4 and 5 weeks respectively, had been bucket-fed after the first 48 hours. These four calves were fed together from buckets and, in each case, their whole ration was consumed in three minutes. Immediately it was finished the two earliest bucket-feeders set upon one another and sucked voraciously at each other's teats. They pursued one another from one side of the yard to the other, occasionally getting into position where each could suck the other (Fig. 8). Their whole behaviour and demeanour was frisky and excited, contrasting strongly with the other calves who, when their ration was consumed, walked quietly away, one to one corner of the yard and one to the other. The contrast, too, was most marked with the conduct of the two calves who had previously been observed feeding from the foster mother. Even allowing for his being slightly older, the calf reared for six weeks on a foster mother was much bigger and seemed in much better condition than the other three.

In Paddock "C" were 20 calves, all of whom were born during the month of January, 1948, and were therefore 3-4 months old when these observations were made. Eighteen of these calves were reared for six weeks on foster mothers and were then, according to the usual technique, put on to bucket-feeding of

Fig. 7.

Fig. 8.

Fig. 7.—Four calves in Paddock "B" aged 4, 5, 6 and 8 weeks respectively. The one aged 8 weeks had been reared for the first seven weeks by a foster mother and one week by bucket feeding; the one aged six weeks had the first week with a foster mother and 5 weeks on the bucket; whilst the two youngest ones were bucket-fed after the second day.

Fig. 8.—Immediately they have finished their feed the two youngest calves, which have been bucket-fed since two days' old, suck at one another's teats in a most voracious manner.

skim milk and dry feed. However, as there were not sufficient foster mothers, two of the twenty calves were bucket-fed after the first 48 hours. They received mother's milk for the first week, whole milk from the herd for the next three weeks and then, over the next two weeks, the change was gradually made to skim milk. The feeding behaviour of these twenty calves was of very great interest. They were mustered into a yard and five at a time were allowed into stalls at the head of which were placed the feeding buckets. In every case the milk ration was consumed in 1-1½ minutes and the calves then passed out into a yard separate from those waiting to come in (Fig. 9). One of the two calves which had been bucket-fed from birth received his feed early and the other one was in the last five. When 15 had fed and passed out into the yard, they all stood around in a placid, quiet mood and the only substitute sucking seen was a very desultory attempt at ear-sucking by one calf for about 30 seconds. When

the last five had finished their milk and passed into the yard, the second of the two original bucket-fed calves was seen to nudge her way busily in and out of the herd until she found the other original bucket-feeder. Immediately she found him, she proceeded to suck very busily at his penis (Fig. 10). She was

Fig. 9.

Fig. 10.

Fig. 9.—Calves born in January, 1948, and therefore aged 4 months when the photo was taken, show no sign of substitute sucking after they have finished their milk ration. They were reared for the first six weeks by foster mothers.

Fig. 10.—All calves in Paddock "C" have now consumed their milk ration. The only two which have been bucket-fed from birth are shown together, the one busily sucking the other. No other calves in this group show any interest in substitute sucking.

nudged aside once by another calf and immediately went round the other side and started sucking again. Soon there was a trickle of urine from the sucked calf and this was sucked up.

I was informed that the procedure is always the same—the 18 calves reared on foster mothers for six weeks never suck one another but the remaining two always do so. Dry feed was next put into troughs nearby and no further substitute sucking was observed. The two sucking calves seemed not to have the same excellent condition and bloom as the other calves and, from the dairyman's point of view, it might well be that the elimination of this substitute sucking in calves would result in better developed animals. From the point of view

of feeding behaviour, even a comparatively short period of natural sucking-feeding seems sufficient in the calf to satisfy the sucking-feeding instinct and, once satisfied, the calves progress easily to a more developed stage in which infantile practices are left behind. They don't resort to substitute sucking during their time with the foster mother and neither do they resort to it after they have graduated to the next stage in their development.

If, however, the sucking-feeding instinct *never* receives satisfaction, as with the two calves in Paddock "B" and the two older ones in Paddock "C", then substitute sucking is resorted to in an endeavour to satisfy the instinct. Of great importance, too, is the indication that the mere lapse of time alone will not cause the practice to stop. In Paddock "C" 18 calves who have had their sucking-feeding instinct satisfied have progressed easily to the next developmental stage, but the two calves who have *never* had this instinct satisfied, although of the same age and now being fed in exactly the same way and with similar rations, still cling to the infantile sucking practice.

The meaning of these observations, as applied to human infant behaviour, is of great importance. An instinctive demand requires satisfaction at its appropriate time and the individual—infant or calf—can then progress easily and naturally to its next stage of development. If, on the other hand, an instinctive demand is denied satisfaction at its appropriate time, the search for satisfaction will persist and extend into later stages of development. Thumb- and finger-sucking amongst infants and children is an exactly parallel process in the great majority of cases.

C. Mallanganee.

The following day Mr. McLaren, Dairy Officer of the Agriculture Department, and I proceed some 50 miles to Mallanganee where arrangements had been made with Mr. P. J. Carey for observations of a number of Hereford cows and calves. Great difficulty had been experienced previously in observing the habits of beef cattle, owing to the fact that they are usually scattered over a very large area, but the splendid co-operation of Mr. Carey made it possible to make observations of a large number of cattle at his property, "Culmaran".

His staff had mustered for my benefit a mob of 55 Hereford cows and their 55 calves, the ages of which ranged from one week to four months. The cows had been put into one yard and the calves into another nearby; and they were not permitted to have access to one another for seven hours before the observation was made. Four hours is the usual time which elapses between feeds and, consequently, the calves were very hungry by the time we arrived, and both cows and calves were extremely vocal on the subject. The calves showed no sign of sucking one another at this stage.

In order to observe the behaviour of a few cattle first, seven cows were admitted to the calves' yard. Each calf would feed only from its own mother and, after some jostling round, the seven mothers and calves came together (Figs. 11 & 12). Mr. McLaren and I both timed different groups and noted that the shortest feeding time was 10 minutes and the longest 16 minutes. Times taken of other pairs subsequently established 13½ minutes as the average feeding

Fig. 11.

Fig. 12.

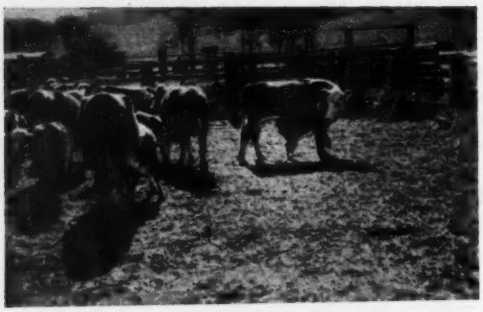

Fig. 11.—At Culmaran. Seven Hereford cows are admitted to the calves' yard.

Fig. 12.—Feeding in progress.

time; and this corresponds very closely with the time taken by the Guernsey calves at the Experiment Farm.

After the first seven calves had finished feeding they were watched closely but no substitute sucking of any sort was observed. All cows and calves were then driven into a large neighbouring yard. There was a great deal of milling round till mothers and offspring found one another and then feeding proceeded without further hindrance. I was able to move about freely in the yard amongst the cattle and so, too, did Mr. McLaren and Mr. Carey, but not one instance of substitute sucking was observed. After feeding, many of the calves moved about together and the older ones cropped a bit of grass, but there was not the slightest suggestion of one calf attempting to suck another and their general demeanour was calm and contented (Fig. 13). All cattle were kept in the yard for 20 minutes after feeding had ceased and were then driven back to their grazing ground.

Beef calves such as the Herefords normally run with their mothers for nine months and are then weaned. They are not bucket-fed at any stage and their behaviour provides a dramatic contrast to the behaviour of dairy calves which are normally weaned within 48 hours of birth and reared on the bucket.

Fig. 13.—Another group of calves, after feeding. They are all placid and contented and show no sign of substitute sucking.

From Culmaran our party proceeded to Lone Pine Dairy Farm, owned by Mr. J. Schubring, where we were able to watch the feeding of 40 Jersey calves aged from 3 weeks to 4 months. The calves are fed twice a day and they line up six abreast at feeding stalls and drink skim milk from buckets (Fig. 14). No dry feed is given. Those aged 3-4 weeks took an average time of three minutes to consume their ration, whilst the longest time taken by the older calves, aged 3-4 months, was two minutes and in two cases the ration was consumed in less than a minute.

Immediately after feeding, the most furious ear-, teat-, and flank-sucking took place and, on more than one occasion, calves were seen to interrupt feeding in order to fasten on to the ear of their neighbours (Fig. 15). It was interesting to note, too, that the substitute sucking continued in a most persistent manner for at least 15 minutes, thereby closely approximating to the time normally taken by a calf to take a feed from its mother or foster mother (Figs. 16-18).

There can be no doubt that the sucking instinct possesses a definite intensity which demands satisfaction and, if it is denied in the normal manner, it will find satisfaction in a substitute way. One calf had an extremely interesting history; it was born on 20th December, 1947, was bucket-fed from birth, and its owner kept it in a paddock by itself until it was sold to the owner of Lone Pine Farm at the end of April, 1948. It then became one of the mob of 40 other calves and immediately started substitute sucking for the first time. This behaviour presents a close parallel to that noted in young children when forcible means are used to prevent thumb-sucking. In neither case is any progress made towards correcting the practice because the underlying cause, the unsatisfied instinct, remains and, immediately physical restraints are removed, the effort to obtain satisfaction is made by means of the substitute sucking.

A factor which enters into the feeding of the calves at Lone Pine Farm and, I believe, on most dairy farms is that the calves are fed on skim milk only, plus whatever natural grasses they can get for themselves. Thus, there appears to be a degree of under-nourishment and, consequently, compared with the calves

fed by their mothers or foster mothers, they are not only deprived of the natural sucking act but are also deprived of a certain amount of nutritional satisfaction as well. This under-nourishment is probably a factor in the production of

Fig. 14.

Fig. 15.

Fig. 14.—Jersey calves waiting to be fed. No substitute sucking at this stage.

Fig. 15.—The calf fourth from the left finished its milk an instant before this photo was taken and it is already sucking hard at the ear of its neighbour.

substitute sucking, but it is not likely to be of major importance unless the under-nourishment is extremely severe. Observations at the McGarvie Farm strongly indicate that the frustration of the sucking act itself is all important for, whereas a carefully balanced diet of whole milk and dry feed meal is supplied, violent substitute sucking takes place just the same amongst the bucket-fed calves.

Similarly, at the Experiment Farm the two original bucket-feeders in Paddock "C" were fed for one week after birth on mother's milk, the following three weeks on whole milk from the herd and, during the next two weeks, the ration was gradually changed to skim milk. It will be seen, therefore, that from a purely nutritional point of view these two calves were at no disadvantage as compared with the other 18 and the only discernible difference in the feeding routine to account for the substitute sucking was the frustration of the sucking act. There is no doubt, therefore, that the sucking act is the core of the feeding instinct and that its frustration will always promote substitute action.

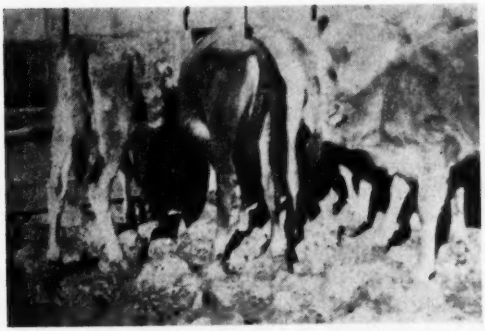

Fig. 16.

Fig. 17.

Fig. 18.

Fig. 16.—The calf at the rear was the first of this batch of six to finish its milk and it immediately started to suck the teats of another calf still feeding.

Fig. 17.—Furious substitute sucking goes on for 15-20 minutes after feeding. A noticeable feature is the sense of extreme urgency which pervades the whole process.

Fig. 18.—The calves are still grouped together and jostling for position.

From these cattle observations it is apparent that there is a fundamental reason for the marked difference in the behaviour of calves under different conditions. Of the 55 Hereford calves not one resorted to substitute sucking after being fed by its mother, whereas the 40 Jersey calves all sucked one another furiously after being fed. That the significant difference does not lie in the fact that the Herefords are beef cattle and the Jerseys are dairy cattle is shown by the behaviour of the Guernsey calves raised by foster mothers at the Wollongbar Experiment Farm and the Jersey calves raised the same way at the McGarvie Smith Animal Husbandry Farm. In the one case substitute sucking was entirely absent and in the other it was noticed for a few seconds only.

The essential difference lies in the fact that on the one hand the 55 Hereford calves run with their mothers, are fed by them and have their sucking-feeding instinct completely satisfied. Substitute sucking, therefore, never takes place. The same applies to the Guernseys observed at the Experiment Farm and the Jerseys at the McGarvie Smith Farm which were reared on foster mothers. The 40 Jersey calves observed at Lone Pine Farm on the other hand had been weaned from their mother 24-48 hours after birth and thereafter fed from a bucket. The satisfaction of the sucking-feeding instinct had been completely denied and, as this instinct is always strongly aroused by the taking of food, the fierce substitute sucking observed was the attempt on the part of the calves to satisfy this instinctive urge.

This behaviour amongst calves is exactly similar to thumb- and finger-sucking amongst infants. In both cases it is caused by failure to satisfy, either wholly or in part, a basic instinct. In the human infant, as has been pointed out, this sucking-feeding instinct is much more delicately balanced than in calves and operates for a much longer time, because the human infant is *entirely* dependent on the sucking act to obtain its nourishment for almost the first nine months of life. The calf *can* drink from a bucket from birth and the calf *can* eat dry feed and grass from a very early age and, therefore, although the sucking-feeding instinct is very strong, it can be satisfied much more easily and over a much shorter period of time with the calf than can be done with the human infant.

This is demonstrated very clearly by the fact that the six weeks' period of nursing by foster mothers of the Guernsey calves was enough to satisfy the instinct. After that time they had outgrown it and could be fed from buckets and with dry feed without any substitute sucking taking place. The two calves of the same age who were bucket-fed from birth and still persisted in their sucking activities after the others had outgrown it seem to present a very close parallel to the human infant who turns to thumb-sucking for substitute satisfaction during the oral stage and, never quite achieving it, persists long after the time when the normal sucking activity should have been outgrown.

In a word, then, both human infants and calves are possessed of a strong sucking-feeding instinct. If this instinct is fully satisfied, no substitute sucking will take place during the oral stage of existence, nor will this infantile practice be carried over into the next stage of development. If, however, this instinct is either partially or wholly unsatisfied, then substitute sucking is resorted to in the form of thumb- or finger-sucking in the infant, and ear-, teat- or tail-sucking amongst calves.

D. Further Observations at the McGarvie Smith Animal Husbandry Farm.

In June, 1948, a series of calf-rearing experiments was started at the McGarvie Smith Farm under the direction of Mr. H. J. Geddes, M.Sc. (Agr.), assisted by Mr. L. Stephens, B.V.Sc., and Mr. J. Young, and I am permitted to say that, as a result of my previous observations of calf sucking habits which have been described in this thesis, an artificial sucking device was introduced for feeding the calves. From the veterinarian's point of view it is believed that the elimination of the substitute sucking practice will result in better developed and healthier animals. My interest in the experiments, however, lay in observing the effect of an artificial sucking-feeding device on the behaviour of the calves, because of the close parallel with infant feeding and infant behaviour. After the first batch of seven calves had been at the Farm for 14 days, I spent two days there observing their behaviour and collaborating with Mr. Geddes and Mr. Stephens in effecting improvements in the nipple-feeding device.

This device is not new, for it had been tried out some years before and discarded as unsatisfactory. The reason for its falling into disuse appears to have been because of a failure to appreciate the need for establishing a proper balance in the feeding routine. This means that not only must the ration of milk be adequate and obtained by sucking at a nipple instead of drinking from a bucket, but also the nipple-feeding device must be so adjusted that the sucking continues for a sufficient length of time to satisfy the instinctive demand behind the sucking act. If the sucking time is too short, the demands of instinct remain unsatisfied and substitute sucking, although perhaps reduced, will nevertheless still occur. I was able to point out that an adequate sucking time was essential for the establishment of a proper feeding balance and I was confident, too, that, once this balance was established, no substitute sucking of one calf by another would take place.

Seven calves were used in the experiment—three Australian Illawarra Shorthorns, one Guernsey, two Ayrshires and one Crossbred A.I.S. and Ayrshire.

Fig. 19.—The artificial nipple and rubber inlet tube.

The youngest calf was 14 days old and the oldest 20 days, and they had all been at the Farm for 14 days, during the whole of which time they had been fed from the nipple-feeding device. For the few days after birth till their transfer

to the Farm they had been fed by their mothers. The nipple-feeding device consists of a long rubber teat with a small opening from which the milk may be sucked, whilst the other end has a thick rubber collar and wider opening into which is inserted a rubber tube (Fig. 19). The other end of this rubber tube is immersed in the bucket of milk. At one end of the feeding stalls is a panel with a hole bored to accommodate the nipple exactly, while the collar prevents it being tugged right through. The calf sucks at the nipple and draws the milk up from the bucket. The shelf for the buckets is placed on the opposite side of the feeding panel to the calves and is lower than the nipple, so that the calf gets no assistance from gravity but has to suck against it.

An examination of the artificial nipples disclosed the fact that they had very open apertures and it was at once obvious that this enabled the calves to suck up their milk ration far too rapidly, resulting in a very incomplete satisfaction of the sucking urge. It was my suggestion that the rate of consuming the milk ration be controlled so as to approximate as nearly as possible the time taken by a calf feeding from its mother. This was all the more important, too, because artificially-fed calves are fed only twice a day, whereas naturally-fed calves feed 4 or 5 times a day. This suggestion was at once accepted and control

Fig. 20.

Fig. 21.

Fig. 20.—Metal tube with jet inserted into the intake end of rubber tube.

Fig. 21.—Artificial nipple about to be inserted into hole at the head of the feeding stall.

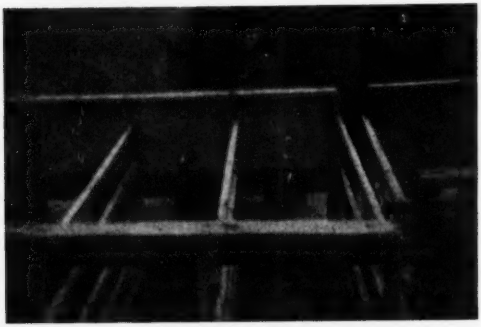

Fig. 22.

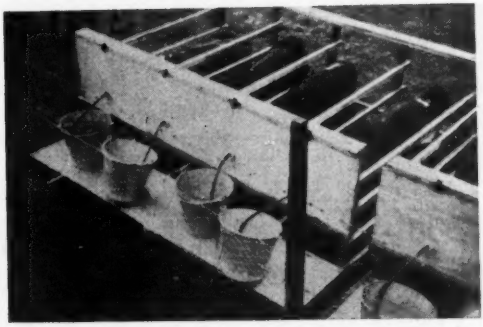

Fig. 23.

Fig. 22.—Feeding stalls with artificial nipples in place.

Fig. 23.—Feeding stalls and nipple-feeding device in operation.

of the consumption rate, and hence the sucking time, was attempted by means of closed metal tubes bearing graduated jets which were inserted into the intake end of the rubber tubes.

For the two weeks previous to my visit the intake jets had not been used and under these conditions the full ration of whole milk (calculated at one-tenth of body weight of each calf) was consumed in five minutes at first, but this time soon decreased until only three minutes was being taken. The procedure had been to withdraw the nipple from the calves immediately the milk was finished. Substitute sucking of a somewhat desultory nature did take place and the calves were very lively and frisky. When first used, the jets on the metal intake tubes were varied from one to seven, each jet being one-sixteenth of an inch. At the 4 p.m. feed on the first day, six calves were fed in the stalls with the intake jets ranging from one hole to six and the seventh calf, which was recovering from an illness, was fed separately. All calves had finished their ration in 6½ minutes but the variation in time was not very great, because the calf on the two-hole jet was finished first in five minutes and the others finished in quick succession till the calf using one jet finished after 6½ minutes. All calves continued sucking vigorously at the nipples but, after three minutes of this dry sucking, the nipples were withdrawn from the two calves which had fed

from the one jet and the four jets respectively, and they were driven out of the stalls. One wandered away but the other was obviously unsatisfied and tried to back into the stall. When blocked, it walked round to the head of the stall and nudged at the veterinary officer who was standing there. The nipple had only just been taken out and this was detached from the intake pipe and offered to the calf. He immediately sucked it up and wandered around for a few minutes sucking hard at it like a dummy.

The remaining four calves were allowed to suck at the nipples for another five minutes after the milk had been consumed and they were then driven out of the stalls. All wandered contentedly off together, and no substitute sucking of any kind was observed. The sick calf was then given its ration, which was half the usual amount, using the one-hole jet. Its feeding time was 3½ minutes.

Although no substitute sucking of one calf by another was observed after this experiment, because the sucking urge had been satisfied, the continuation of sucking at the nipple after the milk has gone is considered undesirable from a purely physical point of view, because the calf is only sucking the air. The aim, then, is to so arrange the aperture of the jet or, better still, the aperture in the teat, that the consumption of the ration will synchronise with the satisfaction of the sucking instinct. According to the observations of the Hereford cattle at Lismore and the Guernseys reared on foster mothers, this should take from 10-15 minutes.

For the 8 a.m. feed on the second morning the intake jets were again altered so that every one had one jet of one-twentyfourth of an inch. This time two calves finished their ration in five minutes, one took 5½ minutes, one took six minutes, two took seven minutes, and one (the sick calf) took eight minutes. The first six were all allowed to remain at the nipples after the milk was finished until they tired of it and backed out of the stalls of their own accord. One calf stayed and dry-sucked for six minutes, and the others stayed for 13, 14½, 16, 19½ and 21 minutes respectively. The calves were still getting their milk ration rather too quickly but the only sign of substitute sucking observed was when one calf sucked for a few seconds at the corner of a sack which was hanging over the fence. After leaving the feeding stall they all wandered off quietly together, without any attempt at sucking one another, and their general demeanour was very like that of the contented mother or foster-mother-fed calves. The seventh calf—the one which had been sick—was fed by means of the nipple device and, after taking eight minutes to consume its milk, the nipple was immediately taken from it. It mixed with the other calves but made no attempt to suck any of them.

It seems very probable that, if they are permitted to do so, the calves will continue dry sucking for a longer period than is actually necessary to satisfy the sucking instinct and the synchronisation of sucking and milk intake at a period of 10-15 minutes would probably provide complete satisfaction. The nipples could then be withdrawn and dry sucking prevented. In exactly the same way, in the feeding of human infants, the aim should be to synchronise the necessary milk intake, whether from breast or feeding bottle, with the satisfaction of the sucking instinct.

When a calf is feeding from its mother and is coming to the end of its feed, it will be seen to bunt repeatedly at the mother's udder with its head in an endeavour, apparently, to induce the flow of more milk. That the nipple-

feeding device does, in all probability, promote similar feelings in the calf is supported by the fact that all calves at the nipple-feeding device were observed to bunt at the nipples in exactly the same way.

If the principles underlying calf feeding are similar to those of human infant feeding, and all the evidence suggests that they are, then one would expect that the sucking-feeding instinct of an infant who obtains his normal amount of milk in very quick time would be unsatisfied and that he would turn to substitute sucking—in this case his thumb—in his efforts to obtain satisfaction. This is exactly what happens. There is a lack of synchronisation between nutritional intake and sucking satisfaction just as there is with the calves, resulting very often in the adoption of thumb-sucking. How many infants are affected in this way and how many, if any, have their sucking instinct frustrated and yet do not turn to thumb-sucking is not known. It is certain, though, that of the known thumb-suckers a very high percentage of their mothers report an over-rapid and over-free milk supply, resulting in the feeding time being markedly less than normal. All this corresponds exactly with the behaviour of calves.

At the 4 p.m. feed on the second day two new jets were used which were finer still, whilst the other five teats were left without jets at all. The teats themselves have very open apertures, $\frac{1}{4}$in. diameter, which allow the milk to run out quite freely if the bucket is raised above the level of the teat. The five calves sucking teats without any jet control at the intake end took 3, $3\frac{1}{2}$, 4, 7 and 8 minutes respectively to finish their milk, the sick calf being responsible for the 8-minute feed. Immediately they had finished their milk, the teats were removed and the calves driven from the stalls. They made no attempt to suck one another but they were obviously unsatisfied because, instead of wandering away and taking no further interest in the feeding process, as they had done in the morning, the three calves with the short feeding times hung round the stalls and tried to get back again and, when prevented from doing so, they tried to get round the head of the stalls to get at the buckets of milk belonging to those still feeding. It was not hunger which prompted this behaviour, because the ration was the same on each occasion. Their behaviour demonstrated afresh the need for satisfying the sucking urge as well as the nutritional need.

The two calves using the fine jets took 17 and 20 minutes respectively and, even then, the latter calf had to have the jet changed for a larger one because it wasn't making any headway. When these two calves had finished, the teats were immediately removed and the calves wandered off contentedly.

The use of a controlling jet at the intake end of the tube is not the most satisfactory method of controlling the milk flow, because a partial vacuum is created in the nipple and the inlet tube. It seems, therefore, that the most desirable arrangement would be to reduce the aperture in the teat itself to a point at which complete satisfaction was obtained. In this way the tube and teat would remain full of milk as the calf continued to suck. The device would then be similar in operation and principle to the infant feeding bottle and both are capable of adjustment to the point where nutritional and sucking requirements can be met.

With the human mother the control of the too-free supply of milk from the breast presents a more difficult problem and, as has been already pointed out, the nipple shield on which the teat aperture can be regulated seems to provide the most certain means of achieving a proper balance.

The outstanding fact which emerges from these calf observations is that satisfaction of nutritional requirements alone is not sufficient to prevent fierce substitute sucking but satisfaction of nutritional requirements synchronised with satisfaction of the sucking instinct, either at the mother, foster-mother, or nipple-feeding device, produces a balanced feeding situation which is not followed by any substitute sucking whatever. Allowing for the fact that the human infant develops much more slowly than the calf and that his mental and emotional processes are much more delicately balanced, nevertheless, the evidence is very strong that the basic principle is exactly the same. If every aspect of the feeding situation is in perfect balance, no substitute sucking of thumb or finger will be resorted to but, if the feeding situation is not in perfect balance, then the greater the imbalance—and frustration of the instinctive sucking act is a major factor in producing an imbalance—the greater is the likelihood of substitute thumb- or finger-sucking occurring.

McGarvie Smith Farm—17.7.48.

As the observations of the use of the nipple-feeding device made in June, 1948, were only of seven calves, another visit was made to the McGarvie Smith Farm a month later to observe the behaviour of 15 calves, 7 of which were those previously observed. The original seven calves were now in their seventh week and, during the preceding week, thir milk ration had been cut down so that they were now receiving 1½ pints of whole milk at each feed instead of 2½ pints as previously. The object of this was to maintain a gradual reduction until they were weaned off milk feed altogether at nine weeks. Of the remaining 8 calves, 2 were in their second week, and 6 were in their fourth week. One of the younger calves had been isolated for the previous two days because of a mild bout of scours. It was being fed only half its usual ration of milk whilst sick but it was intended to supply it with the normal full ration the following day.

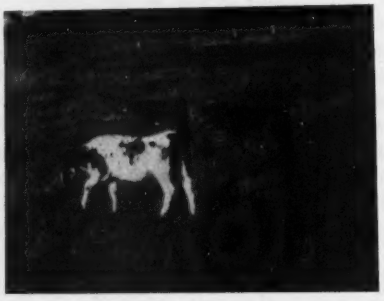

Fig. 24.—This shows the behaviour of the calves immediately after leaving the feeding stalls. All had finished their milk and had been allowed nine minutes' sucking time in all. There was no substitute sucking.

Although it was recognised that adjustment of the aperture in the nipple was the best method of controlling the rate at which the milk was consumed, it had not yet been possible to have the necessary alterations made to the nipples and the metal jets were still being used at the intake end of the rubber tube, all containing two jets of 1/32in.

Before the feeding of the 14 healthy calves started, it was decided to withdraw the nipples from 3 of the older calves immediately their milk ration was consumed but to allow the remaining 11 calves to continue sucking at the nipples for 9 minutes, even though the milk might have been consumed in a shorter time. The first calf finished his ration in 2½ minutes and, when the nipple was at once removed, he seemed very dissatisfied and tried to suck the fingers of the veterinary student who was leaning over the stall watching him. As soon as the first three had finished, they were all driven out of the stalls and their behaviour noted. No substitute sucking occurred, although they loitered around the stalls for a short time (Fig. 24).

Of the remaining 11 calves, 10 had finished their ration well within nine minutes but were allowed to remain and, at the end of nine minutes, they were driven from the stalls. The remaining calf was one of the youngest and was a poor sucker. He remained to finish his ration in 25 minutes.

Soon after this batch had left the stalls, one of the older calves was observed to suck at the teats of another calf and to continue with this substitute sucking for 1½ minutes. All the other calves seemed to be perfectly contented and showed no signs of substitute sucking (Fig. 24). There seems little doubt that a certain duration of sucking time is an essential requirement in providing complete satisfaction during the feeding process but it is interesting to note that the calf which indulged in the substitute sucking was one which had been left at

Fig. 25a.

Fig. 25b.

Fig. 25c.

Fig. 25d.

Fig. 25.—The calf in this series had been sick for two days and was being given only half the usual ration of milk. It was fed by means of the nipple-feeding device although this was held in the hands instead of being used in the feeding stalls. (See "a".)

Immediately the milk was consumed the nipple was withdrawn and, of course, this meant that not only did the calf obtain only half its usual ration, but that its sucking time was extremely short also. Its subsequent behaviour was shown in "b", "c" and "d". First, an attempt was made to suck the disconnected nipple; then a most determined effort was made to suck Mr. Young's fingers. The calf was obviously unsatisfied and was urgently trying to complete its satisfaction with substitute sucking.

the nipple for nine minutes. On the other hand, it had had its ration cut down only a few days before from 2½ pints a feed to 1½ pints a feed. Possibly this cut was too drastic, resulting in an imbalance in the feeding process and thus giving rise to the substitute sucking. In any case the imbalance must have been only slight because the substitute sucking lasted only a short time.

The calf which had been sick was fed last and the nipple was taken from it immediately it had finished its milk in 3-4 minutes. As it had received only half ration and its sucking time had also been short, it was very far from satisfied and repeatedly tried to suck at the empty nipple, then tried to suck at the veterinary officer's hand and, when rebuffed, he turned his attention to me whilst I was trying to take his photograph (Fig. 25).

These and previous observations show very clearly that it is quite possible to provide a perfectly balanced feeding routine, using the artificial nipple-feeding device and that, when this is done, no substitute sucking takes place.

Certain fundamental principles must be observed but, within the limits of these principles, there is scope for considerable variation in individual behaviour.

E. The Effect of Hunger.

Experiment carried out at the McGarvie Smith Farm from 23.8.48:—

If, as has been suggested, the satisfaction of the sucking-feeding instinct in the infant is dependent upon a properly balanced feeding routine, then a serious disturbance of this balance in any one of a number of ways will result in a search for substitute satisfaction. There can be no doubt that frustration of the vitally important sucking act itself will cause this but so, too, will lack of food, despite a sufficiency of sucking activity. In order to demonstrate this, it was decided to establish a number of young calves on the nipple-feeding device, provide them with a normal ration, and allow them to suck at the nipple for ten minutes or until they had finished their milk, whichever period was the longer. This meant, of course, that if they should finish their ration in less than ten minutes they would be allowed to continue to suck the empty nipple till the full ten minutes had elapsed. Their behaviour would be observed for several feeds under these conditions and then their milk ration would be cut by three-quarters. They would receive the same quantity of fluid but, instead of whole milk, it would be changed to one-quarter of whole milk and three-quarters of water. The sucking time and all other conditions would remain constant. After three days of this reduced ration, they would be returned to normal rations of whole milk. Quick changes were decided upon, so as to reduce to a minimum the possibility of habit formation.

Two one-week old calves, Nos. 495 and 496, arrived at the Farm on 17.8.48, one being a Friesian and the other an Ayrshire. They were established on the nipple-feeding device at once and, for the first week on the Farm, were fed 2 pints of whole milk per feed. On 24.8.48 six more calves arrived, Nos. 575-580, one being an Ayrshire and the remainder Illawarras. All took quite well to the nipple-feeding device except No. 576 which refused food for 2½ days. Normal feeding took place on Tuesday, 24th August, Wednesday 25th and at the morning feed on Thursday 26th. The two older calves received 3 pints of whole milk per feed whilst the five younger ones received 2 pints. No. 576 started to feed on Thursday morning and received 2 pints. Ten minutes' sucking time was allowed in each case but the rations were usually consumed in 6-8 minutes. During this period the only substitute sucking observed was by No. 576 after his first feed on Thursday morning, when he endeavoured to suck one of the other calves' ears. No substitute sucking of any kind was observed amongst any of the other seven calves and they all seemed perfectly contented and quiet on leaving the stalls. After the Wednesday afternoon feed, I moved amongst them and deliberately tried to provoke substitute sucking by offering my fingers to several of them but, in each case, it was refused.

For the afternoon feed on Thursday, 26th August, the ration for all eight calves was changed from whole milk to one-quarter of whole milk and three-quarters of water. The quantity of fluid given remained the same, namely, 3 pints for the two older calves and 2 pints for the six younger calves. The full ten minutes' sucking time was allowed as in previous feeds and, throughout the experiment, jets were used to synchronise as nearly as possible the consumption of the fluid with the actual sucking time. This drastically reduced

ration was continued on Friday, Saturday and Sunday. By Saturday afternoon the calves were hanging round the stalls and bellowing long before feeding time and, even before feeding, three instances of substitute sucking were observed.

Fig. 26.

Fig. 27.

Fig. 26.—This series is typical of the behaviour of the calves whilst they were fed normal rations of whole milk associated with adequate sucking time. None of the seven calves, which were established on the nipple-feeding device during this part of the experiment, showed any sign of substitute sucking. Compare the behaviour of calf No. 580—white patches—with that shown in Fig. 28.

Fig. 27.—These photographs were taken after the calves had been fed for 2½ days on rations consisting of one-quarter of the normal amount of milk and three-quarters water. The sucking time remained constant at ten minutes.

There were many instances of substitute sucking, although the process was not marked by any great degree of urgency.*

*This is one of a series of many instances recorded by the author in his observations.

One calf sucked at a sack hanging over the fence, another sucked at the ear of a mate for a few seconds, whilst No. 495 sucked for more than a minute at the teats of an older heifer.

Fig. 28a.

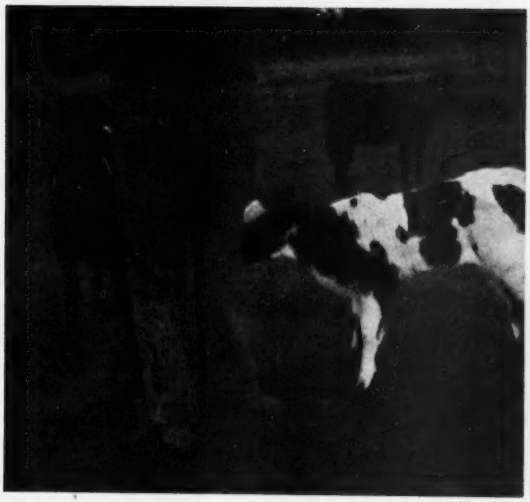

Fig. 28b.

Fig. 28.—"a" and "b" in this series show No. 580 pursuing Mr. Young. In "a" he is sucking hard at his fingers and in "b", when the hands are held out of reach, he is sucking at the leg of his trousers.

At this particular feed all had finished their milk and water mixture at the end of six minutes but all continued sucking vigorously at the nipples till the ten minutes had elapsed, when they were driven from the stalls. Nos. 575 and 578 indulged in some desultory sucking of one another for several minutes; No. 580 pursued Mr. Young persistently for ten minutes, sucking at his pants and at his hands when it could get near them; No. 495 sucked persistently at the teats of an older heifer for 15 minutes, and No. 496 pursued me around the yard, trying to suck at my hands or pants whilst I was trying to take some photographs. The whole atmosphere was in marked contrast to that which prevailed whilst the full ration was being given.

At the morning feed on Sunday, 29th August, the same watered ration was given and the same ten minutes' sucking time allowed. All eight calves finished their ration within six minutes and continued at the nipples till ten minutes had elapsed. On being driven from the stalls, No. 580 immediately pursued Mr. Young just as he had done at the previous feed, making determined efforts all the time to suck at his hands or his pants; No. 579 sucked persistently for several minutes at the teats of another calf; No. 578 engaged in some desultory sucking; No. 576 sucked for four minutes at another's ear, and No. 495 again sucked very persistently for about ten minutes at the teats of an older Guernsey calf.

It seems clear that hunger of itself will produce substitute sucking, although the practice does not seem to possess anything like the same degree of urgency, voraciousness or persistence which is in evidence when the calves have had their sucking activities frustrated by feeding them from a bucket. The important fact remains, however, that severe disturbance of nutrition at the stage of development when food is normally obtained by means of sucking will result in an imbalance of the feeding routine, thereby preventing satisfaction of the sucking-feeding instinct and causing the individual to turn to substitute sucking in an endeavour to find satisfaction.

The indications are very strong that this sequence applies equally to human infants as well as to calves.

(To be Continued.)

GENETICS AND THE TEETH.*

A. C. GABRIEL, D.D.Sc.

The Chairman. You will remember that earlier in this series of Discussions we had an address by Dr. G. F. Finlay on the principles of genetics. The trend of modern thought is towards a realisation of the importance of genetics in the study of diseases generally. In the past we have been on the whole slow to study genetical influences, except in a few very obvious cases as, for example, twins. The present tendency to admit to a much wider application of genetics to human problems is, I believe, a source of gratification to students of Medicine and Dentistry. I shall now ask Dr. Gabriel to open the discussion.

Dr. Gabriel. First I would like to read to you an appropriate extract from a book by Francis Galton entitled "Inquiries into the Human Faculty and its Development", published over sixty years ago (in 1883): "The steady and pitiless march of the hidden weaknesses in our constitution, through illness to death, is painfully revealed by these histories of twins. We are too apt to look upon illness and death as capricious events, and there are some who ascribe them to the direct effect of supernatural interference, whereas the fact of the maladies of two twins being continually alike shows that illness and death are necessary incidents in a regular sequence of constitutional changes beginning at birth, and upon which external circumstances have, on the whole, very small effect."

A certain amount of evidence in support of such a contention has been continually before clinicians for many years, but it would almost seem that man subconsciously turns from that which he is impotent to control or direct. At any rate in the past emphasis has been upon environmental effects and it is only recently that considerable attention has been given to genetic factors. Unless we design our living more in accordance with biological laws there seems little we can do about improving it. Perhaps such a scheme of life facetiously envisaged by Huxley in his "Brave New World" may solve such problems!

From his external appearance we readily recognise Man as distinct from other genera. The reason that it is possible to do so lies in Man's genetic constitution. In the same way, but with variable degrees of uncertainty, we recognise different racial groups of mankind. Just as obvious as the foregoing is the fact that each individual is different.

Our teeth provide a parallel to these conditions. The upper central incisor teeth, for example, are sufficiently similar to one another to be grouped together as obviously different from any other class of teeth, such as molars. Close examination of the teeth within any one class reveals that further subdivision into types is possible. The problem of subdividing a class of teeth into types is somewhat akin to that of determining racial groups, except for two rather conflicting reasons:—

(i) The organism as a whole is complex due to the effects of many thousands of genes, whereas a tooth, being a part of the whole organism, is of necessity less complex.

(ii) Our eyes are better trained to observe differences in the organism as a whole than in a small part, such as its teeth. So there are differences between

*This paper was read at a meeting of the Discussion Group of the Institute of Dental Research, held at the United Dental Hospital on Tuesday, 28th September, 1948.

individual teeth which are beyond our present powers of classification: such differences might possibly result from environmental influences.

The study of identical twins provides a useful measure of the relative influences of heredity and environment. Several workers have examined the anatomy of the teeth of twins but their studies appear to have been limited by the paucity of material available and by the fact that the teeth were examined *in situ*. At the Department of Anatomy, University of Sydney, we were fortunate enough to obtain teeth extracted from a pair of identical twins. These teeth are pairs of upper and lower first permanent molars. Close study discloses only minute differences between the corresponding teeth.

The conclusion that tooth-form is almost wholly determined by heredity and that inheritance is particulate suggests that types do exist. The types are characterised by structural features, including cracks in the enamel, colour and translucency of both crown and root. There exist also intratypal similarities in (a) the extent of caries in either crown or root or in both; (b) character and extent of facets due to attrition; (c) erosion and staining due to an external deposit.

With regard to erosion it is interesting to note that Tomes commented upon a genus of sea-lion, the Otaria, which shows extensive and generalised erosion of the teeth. The observations regarding the attrition of the teeth suggested there must be some genetic co-ordination between the upper and lower jaws, though it should be noted that Stockard and others demonstrated an independent inheritance. These findings, however, may not be so conflicting as they seem for obviously, because the bones of the skeleton as a whole are in functional articulation, some kind of overall genetic co-ordination does exist.

External staining on teeth indicates the possibility of linkage between a certain gene or genes for this factor and those controlling oral secretions.

From an examination of a limited number of teeth of the Macaque monkey, the rat, the Australian aborigine and the modern white of European origin, it would appear that these animals, at least so far as their teeth are concerned, exhibit an increasing degree of variability from the first mentioned to the last. The teeth of the modern white, when compared with those of the monkey, show a comparatively great variation and the different classes of teeth comprising a dentition (for example molars and canines) appear also to exhibit independent degrees of variability, most obvious in third molars and upper lateral incisors. This latter kind of variability is not apparent in the limited number of monkeys' teeth which have been examined.

I would direct your attention to two interesting specimens I have here. They are lower left molar teeth. Note the degree of similarity of form of the crowns and roots; hypercementosis of the root apices; the tongue of enamel extending between the roots on the buccal side; the pattern of fracture where the distal surface of the enamel is broken; the form of the buccal surface of the crown and the pit thereon; the colour of the crown and roots; the staining, the pattern and the extent of caries of the crown. There is, however, a marked difference in the size of these teeth. Unfortunately I know nothing of their history, beyond the fact that they form part of the Ramsay-Smith collection (Adelaide, S.A.) of extracted teeth. Three possibilities exist:

(i) they may be corresponding teeth from identical twins;

(ii) one may be a left first or second molar and the other a left second or third molar from the same individual;

(iii) they may be corresponding teeth from two individuals other than identical twins.

Quite apart from their considerable difference in size, these teeth, though very similar, do not quite possess the degree of similarity exhibited by the teeth of the twins previously referred to; nor does the second possibility appear to be very likely. I believe the third to be more applicable to these specimens. There are many parallels to this degree of similarity within types of teeth but these particular teeth are notable because of the pattern of the fractured enamel, the pattern and extent of caries and of the hypercementosis.

Also displayed before you are some of the different types of upper central incisors.

Dr. Goldsworthy. The paper is open for discussion. Perhaps you would like to see the teeth first; that may stimulate you to discuss them. . . . . If you have all had an opportunity of viewing the specimens, I should like to invite discussion on them.

Miss Sinclair. Dr. Gabriel, do you think there is one gene for each tooth or one for enamel, another for dentine and so on?

Dr. Gabriel. Ruggles Gates has suggested the possibility of one gene for each tooth but I do not think it is as simple as that. There are indications both for and against such a conception. I have discussed this question in a paper published quite recently, but have not reached any conclusions.

Mr. Lilienthal. Dobzansky, working with Drosophila, found certain wild strains and on plotting the geography of their genes found there is a certain blending between strains: similar work has been done in the United States of America. There is a continual mixing of characteristics which is in accordance with the idea of a slow evolution. Geneticists have shown that one gene can control a single enzyme-action and it is thought that the mutation of a single gene may be responsible for or alter one step in a system of enzyme-reactions. This has been demonstrated with a simple mould (Neurospora). However, if you take certain other characters as a whole (*e.g.*, the appearance of the dentition as a unit) then this group of characters may be inherited as a single unit.

Factors which govern sex are controlled by the relation of the sex genes to other genes. Thus you can get an intermediate type which is neither true male nor true female. Genes can be eliminated from a chromosome. Perhaps your doubt, Dr. Gabriel, that the relationship between these types is an effect of one single gene, is not so difficult to resolve after all. These differences may certainly be single-gene effects, and what control there is of development of the dental mechanism as a whole may be related to groups of gene-arrangements. Statistical analyses indicate the distribution of genes in the population. The only way to solve a problem of this type is to get sufficient numbers of teeth and then go ahead from there by taking singly definite characters and determining their distribution in the population, followed by testing their relationship to Mendelian laws. It would take a great deal of time and a great number of specimens. Isolated examples of differences make one think they may be environmental effects but the examination of large numbers is essential before a definite conclusion can be reached as to whether this is so or not.

Dr. Gabriel. I consider that the specimens I have put before you are sufficiently convincing. I am classifying a further 3000 upper central incisor teeth, which are part of the South Australian collection. These teeth are falling into types in a manner similar to previous experience but it is interesting to note that in some respects all vary from those in the Sydney collection. Your suggestion, Mr. Lilienthal, as to the mechanism of gene-action may be reasonable but, so far as I can see, remains speculative. I do not think statistics can be applied to this matter beyond the modified form of tabulation that I have already employed.

Mr. Lilienthal. The development of the science of genetics has been made possible largely by the introduction of statistical methods. Mendel's classical work is important because he was the first to apply such methods to the study of a few characters. The results of his investigations need no comment. In your problem it seems to me that certain major characters of your 'types' should be selected and investigated on the same basis as is used in all genetical work. Such a procedure would reveal the true inter-relationships between characters, *e.g.*, whether they are dominant or not or whether they can be regarded as effects of single genes or a number of genes.

If you assume that a certain 'type' has characters due to a single gene you can determine whether this is probable or not according to Mendelian laws.

Miss Dewar. How much of the preliminary work has been done on animals where it is possible to carry out breeding work?

Dr. Gabriel. I know of none in relation to dental anatomy. Breeding experiments in rats have been done to produce susceptibility and immunity to caries, but I know of none related to the genetics of the anatomy of the teeth.

Miss Dewar. Could preliminary work not be done on animals?

Dr. Gabriel. Given a large enough number of animals, time and money, doubtless it could. The ten monkeys' teeth I have shown you are very similar to one another, so similar indeed that it would be very difficult to distinguish them *in situ* in live monkeys. To obtain any results one would have to await the appearance of a mutant character sufficiently distinct to be recognised and then breed from the mutant-bearer.

Mr. Bailey. I feel that those who have read Dr. Gabriel's paper, which more fully elaborates what he has said, will be convinced of his arguments. I recommend that Mr. Lilienthal do so and it will answer his question.

Dr. Goldsworthy. There seems no doubt that you can separate these teeth into types but what we are discussing further is the basis for the differences between the types. Is it genetic or is it not?

Dr. Gabriel. I have no doubt that it is. I would ask anybody to suggest a better explanation. We are not in a position yet to understand every detail of the mechanism, but that the mechanism is genetic is beyond question.

Dr. Goldsworthy. Dr. Gabriel, you mentioned the question of staining. Suppose one were to get similar teeth from one patient aged eight and another aged eighty, would you expect the staining to give you a hint as to type?

Dr. Gabriel. I appreciate that question: I have often been similarly perplexed. All I can say is that there in front of you is the evidence. You may perhaps disagree with my visual impression of the teeth but, if you agree that

staining falls into types with the degree of coincidence that I see, then there must be some genetic basis for it.

Dr. Goldsworthy. When teeth erupt there can be no stain on them: staining must be a phenomenon of the posteruptive stage.

Dr. Gabriel. I think the explanation is that certain types, being better or worse than others, are lost at different age-levels according to the genetic background. Further, with regard to cracks seen in the enamel of these teeth, many of them have doubtless developed after extraction but the point is that the genetic structure of the teeth predetermines the characteristics of the cracks. Caries of the root is perhaps largely an expression of the age-factor. I think it is mostly seen clinically in old teeth. That type of tooth in addition to being subject to it may genetically be predetermined to remain longer in the mouth. However this is speculation: the evidence is the important thing.

Mr. Bailey. It may have some bearing on the case that each type of tooth Dr. Gabriel has sorted out would be extracted at much the same age in patients' lives because, if what he says holds true, there is a general relationship between *all* the characters and vicissitudes of a given type of tooth.

Dr. Gabriel. Some of the intermediate types may contain these differences. Let us consider racial types in human beings. I could not be depended upon always to distinguish Japanese from Chinese but I think, if I had been living amongst them, I would go close to the mark. I suppose it should be possible to put *all* the teeth into watertight compartments but it is beyond my present capacity to analyse the criteria for such an absolute classification.

Miss Sinclair. In any collection of, say, 300 teeth, how many do you think you can fit into types of all kinds?

Dr. Gabriel. The figures are in my paper; I cannot remember them in detail. At present with the co-operation of another department we are making further examination of types to seek additional criteria by X-ray diffraction, polarised light and electron microscopy.

Mr. Lilienthal. Does one type predominate?

Dr. Gabriel. Yes, though the picture is different in the separate collections of teeth from the two different States.

Mr. Lilienthal. If you take more Sydney teeth (say 3000) you may find the types to be the same as those in Adelaide, may you not?

Dr. Gabriel. As far as I know, the teeth used were random samples.

Mr. Lilienthal. I feel that you have something in these types but larger numbers are needed.

Dr. Gabriel. I feel that these examples should be ample for conviction. However I would be happy to go into the question of greater numbers with you at any time.

Dr. Goldsworthy. We have had an interesting discussion but we have come to the end of the allotted time so that I think we must bring this meeting to a close. These are interesting facts undoubtedly. I think we are all agreed that genetics must be considered in the development of dental structures but without a further study of genetics I think I myself am not in a position to argue more minutely on the matter. I would like to thank Dr. Gabriel on your behalf for the trouble he has taken and the specimens he has brought with him. I hope we have not heard the last of this subject. Thank you again, Dr. Gabriel.

DENTAL MATERIALS.

Current Notes.

ALAN R. DOCKING, M.Sc. (MELB.), A.A.C.I.,
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Introduced here is a regular section in which recent developments in the field of dental materials will be summarised. These notes will be collated by the staff of the Commonwealth Bureau of Dental Standards from various local and overseas sources of information and they will cover abstracts of, and impartial comments on, recent technical literature applicable to dental materials. In addition, useful points arising out of investigations and testing at the Bureau and elsewhere will be included.

It is not proposed to present these notes in a highly technical form but in such a way that they will be of interest. Suggestions would be welcomed, and inquiries regarding materials will be answered in this section if of a nature suitable for publication, otherwise by letter.

Materials Review—1949.

To commence this section it was originally intended to summarise matters of interest arising during the past year from British and American literature on dental materials. This review proved to be too lengthy for inclusion in its complete form in one issue. However, as its publication in small sections over a period of time would delay current matters, it is presented separately.

The Home Front.

In place of the overseas information, perhaps something could be said of developments in Australia. As far as materials are concerned, the accent during the year has been on standards. By this time the first three official Australian Dental Standards should be available, and doubtless a notice to this effect will have appeared elsewhere. It is of interest to note that, judging by the reception of the proof issues, these specifications have created quite a favourable impression overseas.

Other specifications on the way include impression compound, impression plaster, laboratory plaster and artificial stone, hydrocolloidal impression material (reversible or agar type). Proof issues for public comment should be available for some of these in the near future.

During the year investigations on various materials were conducted at the Commonwealth Bureau of Dental Standards. Some of this work was carried out on a fee basis for firms or persons and the results are not therefore available for publication, but there are other points of interest which will be included in future instalments.

DENTAL MATERIALS IN 1949.

Review of British and American Progress.

ALAN R. DOCKING, M.SC. (MELB.), A.A.C.I.,
Commonwealth Bureau of Dental Standards.

On looking over the British and American dental literature of the past year acrylic resins are found to be well ahead numerically, for they form the subject of nearly half the total number of papers on the properties of materials. There are several dealing with amalgams and the remainder consist of single articles on a variety of materials. It cannot be said that any revolutionary advances have been made in the field of materials but there are indications from various sources that novel developments may be expected in the near future. There are several useful surveys which are well worth reading and these will receive special mention in the course of this review.

Brush Up Your Metals.

For those wanting an up-to-date survey of alloys used in dentistry, a comprehensive paper by J. R. Lane[1] of the renowned Massachusetts Institute of Technology can be definitely recommended. Requirements for the composition and the behaviour of alloys are discussed in five groups—amalgams, precious metal alloys, cobalt-chromium alloys, stainless steels and, finally, miscellaneous alloys of aluminium, copper, tin, and even indium, and there are 65 references to guide the reader who desires more detailed information on any of the alloys reviewed. There may be some who would challenge the author's concluding statement that dental metallurgy is still more of an art than a science but all will agree that the search for better dental alloys would be materially aided by the more thorough application of the techniques and data now available to metallurgical science.

How Soon is it Safe to Bite on Amalgams?

In view of the fact that setting rate has received so much attention in connection with the preparation of the new Australian Dental Standard No. T.2 for Amalgam Alloy, it is of interest to note that papers referring to this aspect were submitted for publication within a month of each other from two American Dental Schools. The Michigan School[2] concludes that masticatory stress should not be applied to a restoration less than six hours old, and the Indiana School[3] suggests not less than eight hours, although the faster setting alloys would have a lower minimum safety time. On the completion of amalgam restorations the patient should always be reminded of the dangers of biting upon it too soon.

Of further value is the comparison of mechanical amalgamation with trituration by hand. The authors[2] stress the need for exact directions for the mixing of a specific alloy using any mechanical device if physically unsatisfactory

1. Lane, J. R.—A survey of dental alloys. J.A.D.A., 39:414-37, 1949.
2. Taylor, N. O., *et al.*—The effects of variable factors on crushing strengths of dental amalgams. J.D.Res., 28:228-41, 1949.
3. Phillips, R. W.—Compressive strength of amalgam as related to time. J.D.Res., 28:348-55, 1949.

restorations are to be avoided. Furthermore, no significant improvement in the crushing strengths of mechanically condensed amalgam specimens over those condensed by hand was noted. The choice thus remains one of convenience.

Amalgam Failures.

A further study at the Indiana School of Dentistry[4] of over 1500 defective amalgam restorations indicates that 56 per cent. of the failures were due to improper cavity preparation and 40 per cent. to faulty manipulation or contamination at the time of insertion. It is noteworthy that the effect of the A.D.A. Specification for Amalgam Alloy has been such that very few inferior alloys are now being sold and such failures as occur are attributed to other factors.

More on Amalgams.

Most of the other 1949 publications on amalgam alloys have been of more direct interest to the manufacturer. For example, E. A. Smith[5], author of the well-known text book, has discussed the importance of particle size of alloy filings, and K. H. Strader[6], after consideration of the fundamentals of the silver-tin system, has shown how better alloys may be prepared. He claims that the differential mercury content between the top and the bottom of an amalgam restoration may produce dangerous internal stresses which may be of significance in recorded cases of post-operative pain. It is felt that more clinical and laboratory investigations in this direction are necessary.

That Mercury Hazard.

When the Australian Standard No. T.1 for Dental Mercury appears, you will find footnotes directed towards care in the handling of the metal. How dangerous is the amount of mercury vapour in the dental surgery? L. I. Grossman and J. R. Dannenberg[7] have shown that mercury vapour is definitely present in the air of most dental offices and laboratories, but the proportion is fortunately well below the established toxic limit.

Gold Solders.

N. O. Taylor and C. K. Teamer[8], in a paper presented before a meeting of the I.A.D.R. Dental Materials Groups have endeavoured to bridge a gap in the literature on dental golds. They discuss the properties and testing of gold solders in an efficient manner and suggest specification requirements for them. The U.S. Navy and Army have since adopted these suggestions as a basis for their purchasing specifications.

4. Healey, H. J. and Phillips, R. W.—A clinical study of amalgam failures. J.D.Res., 28:439-46, 1949.
5. Smith, E. A.—Particle size of dental amalgam alloys. B.D.J., 86:34-6, 1949.
6. Strader, K. H.—Amalgam alloy: its heat treatments, flow, mercury content and distribution of dimensional change. J.A.D.A., 38:602-8, 1949.
7. Grossman, L. I. and Dannenberg, J. R.—Amount of mercury vapour in air of dental offices and laboratories. J.D.Res., 28:435-8, 1949.
8. Taylor, N. O. and Teamer, C. K.—Gold solders for dental use. J.D.Res., 28:219-27, 1949.

Anodised Aluminium.

For those who are interested in cast or swaged aluminium appliances, G. Tregarthen[9] has provided information which brings the anodising technique right up to date. He claims that the production of a hard, adherent and corrosion-resistant coating by this method is economical and technically practical in any dental laboratory. The details given in his short paper may be followed without difficulty.

Electroforming.

While on the subject of electrical processing it may be mentioned that A. Novak[10] has listed five difficulties which, he considers, cause the profession to hesitate in accepting copper electroformed dies, in spite of their outstanding advantage of extreme accuracy. These troubles are discussed and methods given for overcoming them.

More Support for Vacuum Investing.

In various papers here, as well as abroad, the benefits of vacuum-investing wax patterns for dental castings have been pointed out. J. Ireland[11] has made a study of the technique, particularly in relation to the quality of the cast surfaces. His statement that the "laborious procedures of filing and fitting distorted or rough castings are almost entirely eliminated" must surely make this investing technique worth considering. No complicated equipment is required, although various commercial "gadgets" are available to those who prefer the ready-made article. Ireland illustrates his own apparatus and discusses others. For better cast model surfaces he confirmed that thick investment mixes should be used, vibration should be minimal, and the wax pattern should be mounted with the fitting surface upward. He showed that burning out the wax in the usual manner produces a better surface than when the wax is removed with the aid of boiling water and suction.

At the Commonwealth Bureau of Dental Standards work has been commenced on various aspects of vacuum investing and several commercial units are included among the equipment to be tried out.

The Hydrocolloid Storage Problem.

How and for how long can hydrocolloid impressions be stored? Until further information is forthcoming the safest rule to observe is "Pour the model as soon as possible." A. G. James[12] of California has something to say on several American brands of the reversible hydrocolloidal impression material, particularly in regard to their accuracy for inlay and fixed bridge work. His experiments, which closely followed clinical practice, proved that most of the materials exhibited a marked dimensional change within a critical time, whether stored

9. Tregarthen, G. G. T.—The anodic treatment of aluminium and its alloys for use in the mouth. B.D.J., 86:227-8, 1949.
10. Novak, A.—Solution of difficulties encountered with copper electroformed dies. J.A.D.A., 39:554-60, 1949.
11. Ireland, J.—Vacuum investing and its relation to cast surfaces. B.D.J., 86:111-8, 1949.
12. James, A. G.—Maintenance of equilibrium in reversible hydrocolloid impressions. Parts 1-3. J.D.Res., 28:108-18, 119-23, 447-55, 1949.

in water or in potassium sulphate solution. This critical period between making the impression and pouring the die varies greatly from one product to another, and some show expansion and others contraction within the time. James suggests that manufacturers should not infer that storage in water or potassium sulphate will result in no damage, but should determine and indicate the safe storage period for their particular product.

Work on local hydrocolloidal impression materials, both the reversible agar and non-reversible alginate types, is in progress at the Commonwealth Bureau of Dental Standards, but the testing procedure described by James can be readily applied by any dentist for his own information. In the meantime, it is considered that the author's recommendation that all hydrocolloid impressions be poured immediately should be adhered to. "Under no circumstances," he says, "should they be immersed in solutions or wrapped in a wet towel and sent out to a commercial laboratory for pouring.

There is Nothing Like Tinfoil !

In an excellent paper[13] by the dental materials team at the National Bureau of Standards, we find a systematic examination of the virtues and, more particularly, the vices of some nineteen commercial and experimental film-forming substances for lining plaster moulds used in the processing of denture bases. Unlike tinfoil, none of these substitutes was found to protect adequately acrylic resin from whitening or fogging. Moreover, the alginate films did not always prevent the adherence of the resin and of the plaster. Treatment of the surfaces of the cured resin with a solvent showed that, with specimens processed against all types of tinfoil substitutes, severe surface strain was present. It is obvious from this work that there is still nothing quite like tinfoil for the lining of plaster moulds.

Porcelain Back in Favour.

An assessment of the relative values of porcelain and methyl methacrylate in jacket crown and bridge work has been attempted by H. A. Pitt Roche[14]. The author, in a lecture to the British Dental Association, went into the subject very fully and concluded that the preponderance of evidence seems to be in favour of the use of porcelain in this work. The paper was followed by a discussion in which Pitt Roche expressed his opinion that there had been a revolution of opinion in England and in the U.S.A., and that the profession were turning away from acrylic resin back to the ceramics. A Sydney dentist also spoke in support of the case for porcelain.

Acrylic Resins.

Many articles on this subject appeared during the last year. If a general survey is required, E. W. Skinner[15] of text-book fame has made an appraisal of

13. Ferguson, G. W., *et al.*—Deficiencies of tinfoil substitutes in the processing of acrylic resin. J.A.D.A., 38:573-86, 1949.
14. Pitt Roche, H. A.—An assessment of the values of porcelain versus methyl methacrylate in jacket crown and bridge work. B.D.J., 87:25-32, 1949
15. Skinner, E. W.—Acrylic resins: an appraisal of their use in dentistry. J.A.D.A., 39:261-8, 1949.

acrylic resins as they stand at present. Then there are two articles on the polymerisation of acrylic resins. The paper by H. J. Caul and I. C. Schoonover[16] is of definite academic interest with practical implications. Ida M. Harman[17] describes her work on the effect of time and temperature on polymerisation, but unfortunately it is confined to one particular type of acrylic resin not available in Australia.

Crazed Acrylics.

S. A. Leader[18] has recently discussed the significance and prevention of crazing in acrylic resins. He concludes that, owing to the poor conduction of heat and high co-efficient of expansion of these resins, strains are produced in the surface of acrylic teeth, when heated through dry polishing. He suggests that new acrylic teeth be tested for strains before use by holding them over solvent vapour for a few seconds and examining for surface crazing. The recommended treatment for the removal of strains that are often induced in acrylic teeth or baseplates is to anneal by raising the temperature slowly to 140°C. (280°F.) and keeping at that temperature for one hour. In order to avoid the induction of strains by dry polishing, plenty of soapy water should be used as a lubricant.

For a full account of internal stresses in acrylic dentures, their detection and analysis, the comprehensive paper by E. Horton[19] is of value. The author finds polarised light the best method for a study of the nature of stresses produced in acrylic dental appliances. He demonstrates the undesirability of strains in a denture and proceeds to discuss their elimination. Acrylic teeth result in less strain than porcelain teeth, so Horton carried this a step further when he suggested that tooth and denture base be polymerised together in a one-polymerisation process, the details of which are given. Incidentally, he confirmed both the futility of using stainless steel gauze as a "strengthener" and its liability to cause warpage.

Materials on Test.

Several testing methods, in addition to those already mentioned, have been suggested during the past year. Two papers have appeared on the important but difficult question of abrasion resistance. F. A. Slack[20] has described the application of the Taber "Abraser" to natural and acrylic teeth. He reports his results as a weight loss for a given number of revolutions of the abrading surface against which the tooth is held. The figures do not show the true state of affairs, as the densities of the materials compared have not been taken into account. In practice, it is the *volume* worn away in a given time that is

16. Caul, H. J. and Schoonover, I. C.—A method for determining the extent of polymerisation of acrylic resins and its applications for dentures. J.A.D.A., 39:1-9, 1949.
17. Harman, Ida M.—Effects of time and temperature on polymerisation of a methacrylate resin denture base. J.A.D.A., 38:188-203, 1949.
18. Leader, S. A.—Acrylic crazing: its significance, prevention and treatments. B.D.J., 87:205-7, 1949.
19. Horton, E.—An experimental investigation of internal strains in polymerised methyl methacrylate as revealed by polarised light. B.D.J., 86:133-42, 176-80, 1949.
20. Slack, F. A.—A preliminary method of testing abrasion hardness. J.A.D.A., 39:47-50, 1949.

significant and, as the density of the hard tissues of natural teeth is two or three times that of acrylic resins, this must be taken into consideration.

Professor J. Osborne[21] of Birmingham has outlined a method for determining the abrasion resistance of dental materials, based on the reciprocating movement of a weighted test piece against sand-blasted glass under water. This well-known authority on acrylic resins has also put through a series of tests on the transverse strengths of British denture base materials[22] and has included reference to strengtheners and repairs. As these resins are all available in Australia, the results are of interest.

In a short paper, W. Johnson and E. Matthews[23] of Manchester have tackled the problem of flexural fatigue resistance of some denture resins. This is a more important property in practice than most of the other mechanical tests, but much difficulty lies in its estimation and interpretation. One of the resins tested, although not noticeably superior in ordinary strength and hardness, showed markedly better resistance to fatigue failure. This particular resin was a copolymer type and this brief report is worth following up with further experimental work.

21. Osborne, J.—Abrasion resistance of dental materials. B.D.J., 87:10-12, 1949.
22. Osborne, J.—Transverse tests in denture base materials. B.D.J., 86:64-7, 1949.
23. Johnson, W. and Matthews, E.—Fatigue studies on some dental resins. B.D.J., 86:252-3, 1949.

DENTAL BALL.

The Annual Dental Ball will be held at the Trocadero on Thursday, 6th July, 1950. Dancing from 9 p.m. to 1 a.m. Admission price is 15/- per single ticket, and tickets are available from the Honorary Secretary of the Sydney University Dental Undergraduates' Association, care United Dental Hospital, Chalmers Street. (Telephone: MA 6964.) Table reservations may be made at the Trocadero after tickets have been obtained.

The proceeds of the ball will be donated to the Research Fund of the Australian Dental Association (N.S.W. Branch).

The DENTAL JOURNAL of AUSTRALIA
N.S.W.

EDITORIAL DEPARTMENT

AN EPISODE IN HISTORY.

Few members of the dental profession realise, when they construct dentures made with modern materials, what historical background lies behind the development of denture bases.

The early introduction of rubber as a base for dentures was not without unfortunate incidents which certainly dramatically changed the course of life for certain individuals and, in one case, cut short that life most abruptly.

It may not be widely known that, when rubber was adopted for the use of vulcanite dentures, the people who developed the method exercised patent rights and required license fees from dentists who constructed artificial dentures on a vulcanite base. Through careful manipulation of patent rights and change of ownership, the rights became assigned to one Josiah Bacon who, acting in what was certainly a high-handed and avaricious manner, extracted large sums in license fees from dentists all over America in the period from 1865 onwards.

His activities in this direction necessitated that he travel far and wide across the United States and in April, 1879, he was in San Francisco pressing his attentions upon the dentists and on one man in particular who had not, despite several law-suits decided against him, paid the necessary license fees nor the legal costs of the various cases. This was Dr. Samuel P. Chalfant, who had moved from various parts of America, more or less to escape the attentions of Bacon, and had finally settled in San Francisco.

The incident which cut short Bacon's career followed a law-suit in which he had taken action against Dr. Chalfant for recovery of license fees and other monies. This was particularly distasteful in that Bacon had been ruthless in his demands and it is understood that the dentist had subsequently attempted to visit Bacon and plead for more liberal terms in the issue. He found him at his hotel and, in the course of the discussion or argument, Dr. Chalfant shot Bacon and disappeared for the next two or three days, but ultimately surrendered himself to the Chief of Police. It was obvious, so it is reported, that Dr. Chalfant was in ill-health at the time when he was detained, although he gave a straightforward description of the whole affair and maintained that he had not gone with the intent to murder Bacon but had accidentally shot him.

The upshot of the affair was that dentists far and wide contributed some 20,000 dollars to a fund set up for the defence of Dr. Chalfant under the name of Dr. S. S. White. After a long drawn out trial, Dr. Chalfant was convicted of murder and sentenced to ten years' imprisonment. Subsequently, he escaped but was recaptured and had to serve out his time.

Thus ended an event which had considerable historical significance for the dental profession. Several things may be noted from it:

1. That an unscrupulous agent successfully demanded fees for the licensing of a process, and that this caused great hardship to considerable numbers of practitioners.

2. That a strong emotional appeal elicited a ready response from innumerable dentists to assist the unfortunate Dr. Chalfant.

3. In view of the extreme antagonism of the dental profession and following on this unfortunate episode, no further attempts were made to extract royalties from practitioners who utilised the process of vulcanisation in the construction of dentures.

It is said that this economic burden on the dental profession resulted in something like 3,000,000 dollars being paid to the company which held the patent rights. When the exaction of royalties was discontinued, the patients benefited in that dentures could be constructed without let or hindrance.

It must be realised that, had acrylic materials been readily available in those days, the profession would have been faced with a much greater difficulty. It does seem that, if the dental profession in the first place had been organised and prepared an extensive defence for the actions of the patentees, the incident would never have arisen, or certainly would have been settled by normal legal processes. However, the peculiar nature of Josiah Bacon brought the whole struggle to a climax and ensured freedom of activity for the profession in the development of a most important phase of dentistry.

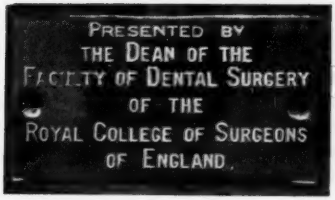
News and Notes

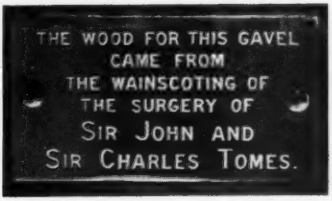
DINNER IN HONOUR OF PROFESSOR R. V. BRADLAW.

On 20th April, 1950, a dinner was given by the members of the Executive Committee of the State Branch at the University Club, Sydney, in honour of the visit of Professor R. V. Bradlaw to this city.

Dr. George Bell, representing the Royal Australasian College of Surgeons; Dr. A. Holmes à Court, representing the Royal Australasian College of Physicians; Professor Harold Dew, Dean of the Faculty of Medicine; Dr. J. S. Baird, President of the Dental Board of New South Wales; Professor A. J. Arnott, Dr. J. V. Hall Best and Mr. W. A. Selle, were also present as guests of the Executive.

During the proceedings, Professor Bradlaw, on behalf of the Faculty of Dental Surgery of the Royal College of Surgeons, England, presented Dr. J. V. Hall Best, President of the Twelfth Australian Dental Congress, with a gavel and expressed the hope that it would be used during the Congress and at future Congresses. The suitably inscribed gavel was made from wood taken from the surgery of Sir John and Sir Charles Tomes.





PRESENTATION OF ACADEMIC GOWNS.

On the evening of Tuesday, 18th April, members of the St. George Dental Association, and the Western Suburbs and Northern Suburbs Dental Groups, gathered at a function held at "Wyoming," Jersey Road, Strathfield, to present to Professor A. J. Arnott and to Dr. J. V. Hall Best, as a token of their esteem, academic gowns of the Fellows in Dental Surgery of the Royal College of Surgeons, England.

Mr. Roy Hawthorne carried out the functions of Chairman in a most admirable manner and Dr. J. S. Baird, President of the Dental Board of New South Wales, and Dr. E. R. Magnus, President of the New South Wales Branch of the Australian Dental Association, spoke on behalf of their respective bodies.

After Mr. A. Brown, Mr. Goodwin Leeder and Mr. F. Thearle, representing their respective organisations, had paid tribute on behalf of their members, Mr. Hawthorne called on Mr. N. E. Edney to present the gifts to Professor A. J. Arnott and Dr. J. V. Hall Best. Both recipients suitably replied, expressing their sincere appreciation of this gesture from the members of the profession.

Mr. R. Harris, the Secretary of the Australian Dental Association (New South Wales Branch), then proposed a vote of thanks to the Chairman.

CEREMONY AT THE CONFERRING OF FELLOWSHIPS IN DENTAL SURGERY OF THE ROYAL COLLEGE OF SURGEONS, ENGLAND.

A most impressive ceremony was witnessed at the Stawell Hall by members of the New South Wales Branch of the Australian Dental Association on Thursday evening, 20th April, when three leading members of the dental profession in New South Wales were honoured by the Royal College of Surgeons, England. For this purpose, Professor Robert Bradlaw, Dean of the Faculty of Dental Surgery of the Royal College, made a special visit to this State.

Dr. Holmes à Court opened the proceedings by extending a welcome to Professor Bradlaw on behalf of those present. He indicated that the visit of a person of such distinction was of the greatest significance and value to the professional men in the community and was an event that was eagerly anticipted by them. He expressed a desire that Professor Bradlaw would enjoy his sojourn in Australia and that he would return to his home as an ambassador of empire.

In reply, Dr. Bradlaw addressed the meeting as follows: "Mr. President of the Royal Australasian College of Surgeons and Mr. President of the Royal Australasian College of Physicians, I am deeply sensitive of your kind welcome. But a few weeks ago it was my pleasant task to bring to the Royal Australasian College of Surgeons a greeting from the President and Council of the Royal College of Surgeons, England. This evening it is my privilege to offer to you, sirs, and your colleagues, the very same greeting. We cherish the bonds of association and even affection which exist between our profession here and in the mother country. It has been our privilege from time to time to welcome young surgeons and young physicians overseas. We count it as a great privilege that they look to us for further education and I can assure you, sir, and assure the Presidents of the Royal Australasian Colleges that they will ever find a warm welcome and every possible assistance in their search for higher knowledge.

I am grateful to you, sir, for making it possible for me to perform my pleasant task this evening in this College so dignified and so hallowed by its associations."

Professor Dew, Dean of the Faculty of Medicine and Professor of Surgery, University of Sydney, then introduced Dr. Percy Chater Charlton to Professor Bradlaw to receive a resolution of commendation from the Faculty of Dental Surgery of the Royal College of Surgeons, England, in recognition of his distinguished services to dental science and dentistry in New South Wales.

Professor Bradlaw read out a citation in honour of Dr. Charlton and presented him with the resolution of commendation.

Professor Dew now presented Professor A. J. Arnott to be admitted to the Fellowship in Dental Surgery of the Royal College of Surgeons. Professor Bradlaw duly admitted the candidate by virtue of the "authority of the President and Council of the Royal College of Surgeons of England."

Dr. J. V. Hall Best was similarly honoured with admission to a Fellowship in Dental Surgery, after Professor Bradlaw had read out a citation of his services to the profession.

Dr. E. R. Magnus, as President of the N.S.W. Branch of the Australian Dental Association, thanked Professor Bradlaw for the part he played in the ceremony, saying: "Were it not for Professor Bradlaw's presence here, the ceremony would never have been held. As most of you know, the Fellowship cannot be presented *'in absentia'* but must be presented by the President of the

Royal College or by one of his colleagues. The President of the Royal College of Surgeons has delegated to Professor Bradlaw the honour and privilege of inducting the first Fellows in New Zealand and Australia. He has already been to New Zealand; he has been in every other capital city in Australia and this is his last ceremony.

To my mind, academic ceremony such as this has a salutary effect on us in that it brings to our minds the obligations that we have towards the school, college or institution which has allowed us to be admitted into this community as professional men. The profession of dentistry is a comparatively young one, and its status in this community has, particularly over the last thirty years, been greatly increased. This increase in status is not due only to the leaders of the profession, three of whom have been duly honoured tonight, but to each one in this room, to each member of the dental profession in this State.

Those of you who have remembered the ideals and ideas in your youth, who have recognised your obligations and who have carried them out in the ordinary conduct of your practice with skill, consideration and dignity, are the ones who have added prestige to the profession and raised the status of it. It is as a result of your efforts that these honours have been conferred on your colleagues tonight.

I do thank Professor Bradlaw for what he has done tonight and I do congratulate those who have been duly honoured. I, as your President, am very proud of you."

Dr. Magnus then thanked Dr. George Bell, who presided at the meeting, and Professor Dew, who made the ceremony possible; Dr. Holmes à Court, within the precincts of whose College the function was held, for his help and the co-operation of the College; Dr. J. S. Baird, President of the Dental Board of New South Wales and Vice-President of the Association; and Mr. Walter Selle, who carried out the duties of Master-of-Ceremonies.

Dr. Bell asked Professor Bradlaw to deliver his address, the subject of which was "Some Aspects of Oral Pathology." Professor Bradlaw pointed out that here was the common ground between surgeon, physician and dental surgeon; his argument was that the mouth had been neglected as a diagnostic sign, and he emphasised its importance. Professor Bradlaw illustrated his lecture with numerous valuable slides.

At the conclusion of the meeting, Dr. Baird thanked Professor Bradlaw on behalf of those present for his comprehensive and entertaining address.

COMMONWEALTH OF AUSTRALIA.

DEPARTMENT OF HEALTH.

Applications are invited for appointment to the position of Dentist, Third Division, Canberra. (Two positions.)

Actual salary payable is from £1,020 to £1,110 per annum (males) and from £913 to £1,003 per annum (females).

Duties will include operative and preventive dentistry at Clinics at schools in Canberra, and allied work.

Applicants should be graduates with standard of training equivalent to that prescribed by the Universities of Sydney or Melbourne for the course of dental surgery or dental science.

Applications, setting out full qualifications and details of experience, age and war service (if any), should be forwarded to the Director-General of Health, Canberra, A.C.T.

AUSTRALIAN NATIONAL MEMORIAL TO AMERICA.

The attention of readers is drawn to the appeal which is being made to provide funds for the erection at Canberra of an Australian National Memorial to America.

Contributions will be gratefully received, addressed to the Secretary of the Australian-American Association, 151 Elizabeth Street, Sydney. A point worthy of note is that such donations are deductible for the purposes of income tax.

ST. GEORGE DENTAL ASSOCIATION.

ANNUAL SPORTS DAY.

The Annual Sports Day of the St. George Dental Association will be held on 19th July, 1950. Members wishing to participate are asked to note that Golf will be played at the Kogarah Golf Club and Bowls at the St. George Bowling Club. For further particulars, please communicate with Mr. N. E. Edney, Honorary Secretary of the Association, LX2315.

Proceeds are in aid of the St. George Spastic Centre.

WESTERN SUBURBS DENTAL GROUP.

6th ANNUAL SPORTS DAY.

The 6th Annual Sports Day of the Western Suburbs Dental Group was held at Concord Golf Club on Thursday, 11th May, and over 120 dentists attended. For the second year in succession, a competition was held in Tennis, as well as Golf and Bowls, and it is anticipated that more of the younger members of the profession will be represented at tennis in the future.

Once again the weather was ideal, which was unexpected after a sequence of dull and rainy days.

At the conclusion of the day's activities, the President of the Group, Mr. Goodwin Leeder, welcomed Dr. Magnus, the President of the A.D.A. (New South Wales Branch) and representatives of the various groups and associations in the metropolitan area as well as those from further afield including Newcastle, Wollongong and the Blue Mountains.

Trophies were then presented by the President to the following winners:—

GOLF.

Cup winner	J. Steele.
Runner-up	J. Fox.
Four ball	S. M. Hicks and Bede Smith.
Runners-up	T. Dobson and F. Holt.
A. Grade	A. French.
B. Grade	Bede Smith.
First nine	H. Hicks.
Second nine	L. Dykes.
Sealed nine	P. Hooton.
Long drive	R. Taylor.
Pitch and putt	R. McDonald.

BOWLS.

Winning team: Q. Harvison, W. Chesher, C. Adair, W. Carter.
Runners-up: T. Purtell, N. Taylor, A. French, R. Reid.

TENNIS.

Winners: E. Cordaiy and W. R. Thompson.

Association Activities

AUSTRALIAN DENTAL ASSOCIATION

(NEW SOUTH WALES BRANCH)

Extract from Minutes of Meeting of Executive Committee held in the Council Room, B.M.A. House, 135-137 Macquarie Street, Sydney, on Monday, 17th April, 1950, at 7.30 p.m.

Present: Dr. E. R. Magnus, President, in the Chair; Dr. A. G. H. Lawes, Vice-President; Dr. F. E. Helmore, Vice-President; Dr. R. M. Cloutier, Honorary Treasurer; Dr. J. V. Hall Best, Mr. N. E. Edney, Mr. H. M. Finnie, Mr. R. G. Leeder, Mr. R. Y. Norton, Mr. F. R. Reid, Mr. J. W. Skinner, Mr. Ralph Tompson, Mr. R. W. Wilson; Mr. S. H. Neal, North Eastern Division; Dr. J. D. Oddy, South Coast Division; Dr. A. G. Rowell, Western Division.

Apologies: Mr. R. Krauss, Mr. H. R. Sullivan, Mr. L. Mackenzie, Blue Mountains Division; Mr. C. D. Reynolds, Newcastle and Hunter River District Division; Mr. G. M. Cox, Southern Division; Dr. J. D. Benson, North and North-West Division.

In attendance: Mr. Robert Harris, Secretary.

Welcome to Mr. Wilson: The President welcomed Mr. R. W. Wilson to the Executive and Mr. Wilson replied suitably.

Minutes: The minutes of the meeting held 13th March, 1950, were signed as a correct record.

Business Arising from Minutes:

Federal Constitution: The President stated that the Committee of the Honorary Officers had considered the proposed amendments to the Federal Constitution as drawn up by the Association's solicitor, Mr. Utz, in terms of the reference from the Executive Committee empowering them to forward notices of motion to the Federal Office. As it was necessary to re-draft one of the proposed Articles, the notices of motion had not yet gone forward as it had only just been considered by the Committee of the Honorary Officers but it was proposed to send the following notices of motion to the Federal Office as soon as possible:—

"That Article 5 be deleted *in toto* and that the following Article be inserted in its place:—

'5. VOTING.

(a) The constituent bodies shall have the following votes with regard to every resolution, namely:—

Australian Dental Association (New South Wales Branch)	4 votes
The Australian Dental Association (Victorian Branch)	3 votes
Australian Dental Association (Queensland Branch)	2 votes
Australian Dental Association (South Australian Branch)	2 votes
Australian Dental Association (Western Australian Branch)	2 votes
Australian Dental Association (Tasmanian Branch)	1 vote

(b) Votes may be recorded by letter or telegram or in the absence of such letter and/or telegram or so far as the same do not extend orally by the representative or representatives of the constituent body present at the meeting.

(c) Subject to the provisions contained in this constitution and subject as hereinafter mentioned all resolutions shall be decided on a majority of votes and if the votes shall be equal the resolution shall be deemed to be decided in the negative PROVIDED HOWEVER that if on the election of officers there be an equality of votes cast for two or more candidates for any office lots shall be drawn as between such candidates and the candidate who is successful in the drawing of lots shall be deemed to be elected to the office.

(d) In the event of a constituent body casting its votes or vote on any resolution orally as aforesaid by two representatives the votes or vote of such constituent body shall be deemed to have been cast in the negative unless both representatives vote in favour of the resolution.

(e) A constituent body may propose any resolution without the necessity of a seconder and may do so by letter or telegram or orally as aforesaid PROVIDED HOWEVER that no person shall be eligible for election as an Officer of the Association at any general meeting unless a constituent body nominates him for that office at least three weeks before the meeting by notice in writing or by telegram to the Association. As soon as practicable after the time has expired for receiving such notices the Honorary Secretary shall communicate to all the constituent bodies the names and addresses of the candidates for each particular office.

(f) Save as aforesaid there shall be no right of voting.'"

"That Article 6 (c) be deleted *in toto* and that the following Article be inserted in its place:

'6 (c) The officers elected at the Annual Meeting in the year One thousand nine hundred and forty-eight shall retire from office at the Annual Meeting in the year One thousand nine hundred and fifty when their successors shall be elected and, thereafter, elected officers shall retire from Office biennially at the Annual Meeting held in every alternate year when their successors shall be elected. In every case officers shall hold office until the conclusion of the meeting at which their successors are elected.'"

It was resolved that these notices of motion be forwarded immediately to the Federal Office.

Congress Commission Report:

The Secretary read the following report:—

Entertainment: The programme for entertainment has progressed in a satisfactory manner with the able assistance of Mrs. Barr, the President of the Ladies' Committee.

Clinical Programme: With the exception of two or three sections, the clinical programme is being established on a satisfactory basis, particularly with the promise of some 30 odd technical films from the U.S.A. We are also pleased to announce that Dr. Roy Ellis, Dean of the Faculty of Dentistry, University of Toronto, will be lecturing in addition to Dr. Terrell.

Trade Exhibits: Plans are completed and the selling of space is under way, for which contracts will be signed in the near future. In addition, the Scientific Exhibit and the Dental Health Exhibit have been given prominent space.

Transport and Accommodation: These Committees are extremely active.

Congress Booklet: This will be distributed to the dental profession in Australia at approximately the end of this month.

Publicity: It is anticipated that a Newsletter will be distributed to the members of this State Branch and various State Officers to add impetus to the Congress publicity.

Reports from Committees:

Dental Health: The Chairman of the Dental Health Education Committee, Mr. Tompson, reported that his Committee sought permission to use the Dental Health Education exhibit at Congress after its display in August, 1950.

It was resolved that this request be acceded to.

Divisions: The Secretary reported that the first week in June appeared to be the time suitable to most of the Divisions for the Delegates from Divisions' Meeting.

It was resolved that the meeting of the Delegates from Divisions be held in the first week in June, 1950, and that final arrangements be left in the hands of the President and the Secretary.

The proposed Rules and By-laws of the Blue Mountains Division having been circulated, consideration was given to them and several minor alterations in the wording and the deletion of the final clause were agreed to.

It was resolved that the Rules and By-laws as drawn up by the Blue Mountains Division for their own use be accepted by this Executive on the alterations agreed to being made.

A letter dated 1st April, 1950, from the Honorary Secretary of the South Coast Division was read relative to the appointment by the Executive Committee of Dr. J. D. Oddy as an additional member of the Executive representing the South Coast Division and stating that at the Division's annual meeting Mr. Ashton Marshall was appointed delegate and Dr. Oddy co-delegate.

The President stated that Mr. Marshall was in the Chair at the meeting when the two appointments were made and that this was done regardless of the fact that earlier the Division had been informed that the Articles of Association provided for one representative only from each Division and he pointed out that, if the Division now wanted some representative other than Dr. Oddy, it would be necessary for the latter to resign and the Division to nominate another representative for appointment as an additional member of the Executive before the Executive Committee could take any action in the matter.

It was resolved that the South Coast Division be advised that the Executive Committee would consider the appointment of whatever representative that Division required but that the Division must first receive Dr. J. D. Oddy's resignation.

Syllabus: The Chairman of the Syllabus Committee, Mr. Skinner, reported that he had received a request from the North Eastern Division for clinicians at a meeting to be held 27th and 28th May, 1950, at Taree, but had not yet made any recommendations.

It was agreed that this matter should be left in Mr. Skinner's hands and the action taken reported to the next Executive meeting.

Membership:

New Members: It was resolved that the following dental practitioners, whose applications were in order and who had paid the requisite subscriptions, be admitted to membership of this State Branch as from 17th April, 1950:—

McKenna, William Henry, B.D.S.; Taylor, Reginald Francis, B.D.S.; Dobbin, Sydenham, B.D.S.; Carver, Warren John, B.D.S.; Gerber, Walter Ludwig, B.D.S.; Hartenstein, Gordon John, B.D.S.; Anderson, Donald Alfred, B.D.S.; Hunter, Keith Ernest, B.D.S.; Hawthorne, William Stuart, B.D.S.; Long, Rex Arthur, B.D.S.

Resignations: It was resolved that the resignations of Miss Alison E. Macqueen, B.D.S., and Mr. K. M. Watts, B.D.S., be accepted as from 31st December, 1950.

Restricted: It was resolved that the following members of this State Branch be granted restricted membership:—Dickson, Robert; Farnsworth, Herbert Jermyn, D.D.S.; Seller, Alfred; Uren, Leonard Sydney.

Re-admissions: It was resolved that the following dental practitioners, whose applications were in order and who had paid the requisite subscriptions, be re-admitted to membership of this State Branch as from 17th April, 1950:—

Roy, R. W.; Jarrett, F. R.; Crouch, F. R.; Skinner, H. A.; Mullaly, R. H.; Torda, S.; Bruhn, G. M.; Sullivan, L. H.; Abbott, R. H.

Correspondence:

Honorary Dentists at St. Joseph's Home for Boys: A letter dated 6th April, 1950, from Mr. J. Egan enquiring the possibilities of obtaining the services of honorary dental officers for the treatment of boys at the St. Joseph's Home for Boys, Kincumber, was read.

It was resolved that this request be published in the Dental Journal of Australia.

University Centenary Celebrations: A letter dated 14th April, 1950, from the University of Sydney, was read inviting this Association to nominate a member for membership of the University of Sydney Centenary Celebrations Committee.

It was resolved that the President, Dr. Magnus, be nominated to represent this State Branch.

NEWCASTLE AND HUNTER RIVER DIVISION

RECENT ACTIVITIES.

A meeting of the Newcastle and Hunter River Division was held on November 25, 1949, and was mainly concerned with the election of office-bearers* for the year.

The Committee Christmas dinner held on 10th December at the Great Northern was well attended, and visitors included Dr. J. V. Hall Best, Dr. E. R. Magnus, Dr. Schalit, Mr. N. E. Edney and Mr. N. W. Kestel.

Dr. Thomas proposed the toast, "The A.D.A.," and Dr. Magnus, in his reply, praised the work and enthusiasm of our President and Dr. Thomas re the central executive.

*Reported in D.J.A., 22:2, p. 102, 1950.

Mr. R. Krauss formally welcomed Dr. Best, who recounted some of his experiences abroad. He remarked on the tragic conditions in England of the dental profession as compared with the conditions in the U.S.A., whose technique and services he held in high regard.

Mr. R. Bruce moved a vote of thanks to Dr. Best, and proposed a toast to the visitors. Mr. N. Edney responded adequately.

In January, a post-graduate course, featuring clinics and lectures, was given by Dr. George Christensen, of Brisbane, who was welcomed at a dinner given in his honour prior to the commencement of the course.

The course, comprising three afternoons at Royal Newcastle Hospital and three evenings at our hall, was well attended by local association members.

Admiration at Dr. Christensen's surgical technique was expressed by one and all, and his lectures at night were conducted in a pleasantly informal style.

On the final evening, 27th January, a general meeting was held, to which members of the medical profession were invited. The response to this invitation was rather disappointing, the subject of the lecture being Oral Sepsis, and its importance in dental and medical practice. Dr. Christensen stressed the importance of co-operation between members of the two professions.

The photographic records from Brisbane Dental School were particularly praiseworthy.

On Friday, 28th April, a General Meeting of the Newcastle and Hunter River District Division was held, at which there was an attendance of 13 members.

Unfortunately, the intended guest speaker, Dr. Rourke, was unable to be present, owing to ill health, and Dr. Champion kindly gave a talk on the history of Newcastle Hospital. Members of this Division are well aware of Dr. Champion's interest in history, as he is a member of the Royal Historical Society.

A very interesting story was related, embracing several early features of Newcastle, as well as personalities associated with the hospital during its development.

At the conclusion of the talk, Dr. J. Thomas moved a vote of thanks to Dr. Champion. Two films were then shown, entitled "Therapeutic Uses of Heat and Cold" and "Hydrotherapy."

New Books and Publications

Periodontia, by Henry M. Goldman, D.M.D., St. Louis, 1949. *2nd Edition.* C. V. Mosby Co. Price £6 11s. 3d. *Our copy by courtesy of W. Ramsay (Surgical) Pty. Ltd., Melbourne.*

The purpose of the book, as stated by the author, is to describe and correlate the fundamental principles of periodontia for the benefit of both student and general practitioner. This he succeeds in doing, in a manner which fully covers the various aspects of the subject.

In the Introduction, Dr. Goldman stresses that periodontal diseases should be looked upon from a preventive point of view, especially in regard to the "local aetiological factors which are known to produce diseases of the investing and

supporting structures of the teeth." Another point he makes is that the control of calculus deposits by proper brushing and frequent dental attention will aid in the prevention of gingival diseases.

The chapter on periodontal anatomy, histology, and physiology is excellently presented. It provides a valuable and necessary basis for the study and understanding of the pathology of the periodontal tissues, to which the following chapter is devoted.

The author briefly surveys the various theories on the aetiology and pathology of periodontal disease. In regard to occlusal trauma, he makes the interesting proposition that it "can occur only if the teeth are occluded at times other than during mastication." This theory is also postulated by Gottlieb. Examples of extra-masticatory causes of occlusal trauma are given as "habits of clenching, bruxism, and setting of the mandible in lateral excursion."

In the chapter on aetiology, Dr. Goldman states that "an adequate and scientific foundation for the systemic theory of causation is lacking." He considers that the most logical explanation seems to be that "systemic factors probably reduce the resistance of the tissue and thus make it more susceptible to local factors which may cause periodontal disease."

In the same chapter the author deals briefly but effectively with the various pathological effects of the loss of a tooth, especially the first molar. This is a most important example of the relationship of preventive and conservative dentistry to periodontia.

Dr. Goldman's treatment of the form of periodontal disease known as Periodontosis or Diffuse Atrophy is probably the best available, but the subject needs further research. The aetiology of this disease is unknown, and there is no certainty as to whether the pathological changes begin in the periodontal membrane, bone, or cementum.

The proof outlined by Dr. Goldman on the origin of supra- and sub-gingival calculus needs further elaboration.

On the question of diet, the author states that it is the sub-clinical forms of nutritional deficiencies that are usually encountered. If that is the case, there must be some way of recognising such a state of deficiency before it becomes clinically apparent. Unfortunately, this question is not discussed by the author.

The chapter on treatment deals fully with every method of obtaining the desired result, including reattachment (limited to the treatment of "intra-bony" pockets), gingivectomy, and various forms of electro-surgery. The discussion on the question of reattachment, however, is short and inconclusive, except when it touches on the treatment of "intra-bony" pockets.

One would have liked to see home-care, especially inter-dental stimulation, more strongly emphasised as an essential element of treatment. Keratinisation of the tissues is hardly mentioned. The author poses the question whether massage (per medium of the toothbrush) is beneficial only in its cleansing action; most periodontists would answer emphatically in the affirmative.

The point is rightly made that sufficient time must be devoted to instruction in oral hygiene; this, however, would be more effective if applied before surgery

is attempted in order to ensure, as far as possible, that the patient will maintain a state of periodontal health after it has been established. In this way, too, areas which at first appear to be in need of surgical treatment can often be restored to a state of normality by conservative means alone.

The subject of Vincent's Infection is handled excellently; the treatment advocated is rational and well-ordered. Due emphasis is given to the need for restoration of normal gingival form after elimination of the actual infection, since it is imperative to eliminate all incubation areas in order to prevent a recurrence of the disease.

There is a very good section on Diseases of the Oral Cavity, including description and discussion of the oral manifestations of systemic disorders. Lesions described include those rising from vitamin deficiencies, diseases of the blood, and endocrine dysfunction. This section constitutes a valuable and concise reference-book on the subject, but it would be greatly improved by the substitution of colour-plates for black-and-white.

The text is profusely illustrated, and the illustrations are placed, for the benefit of the reader, in close relation to the sections to which they refer.

The book should be a valuable asset both to the student of dentistry and to the practising dentist, since it covers the whole field of periodontia in a simple thorough, and well-ordered manner.—R.T.

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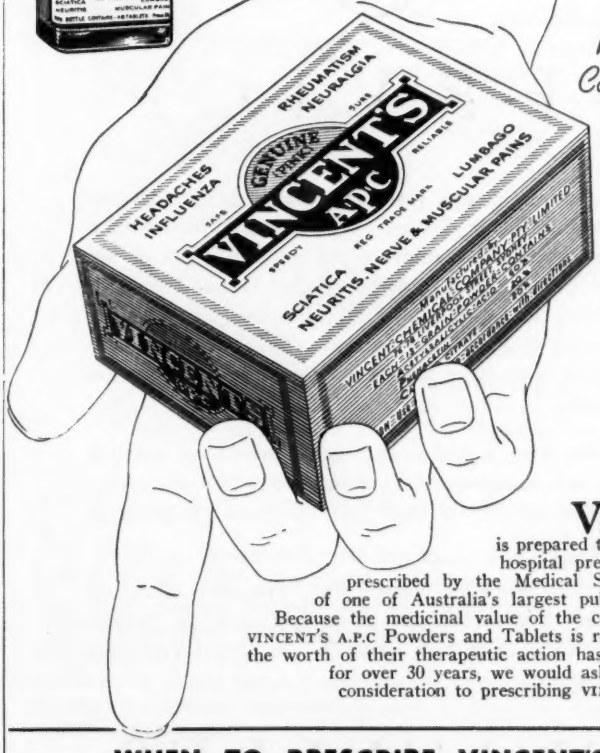

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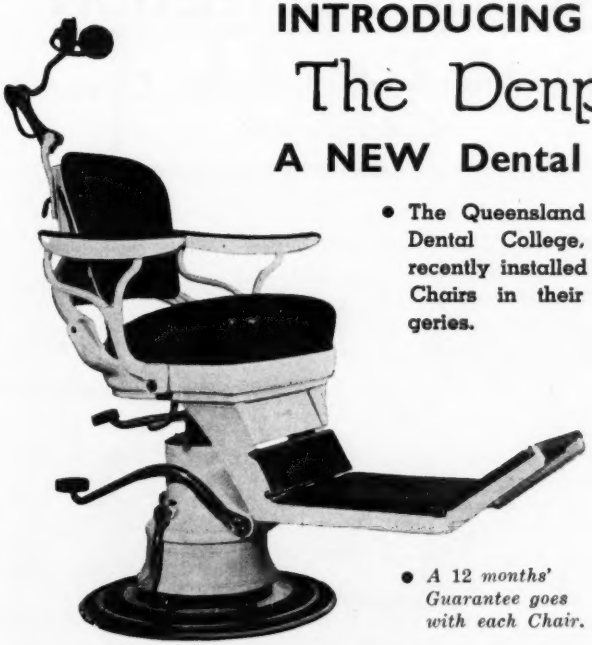

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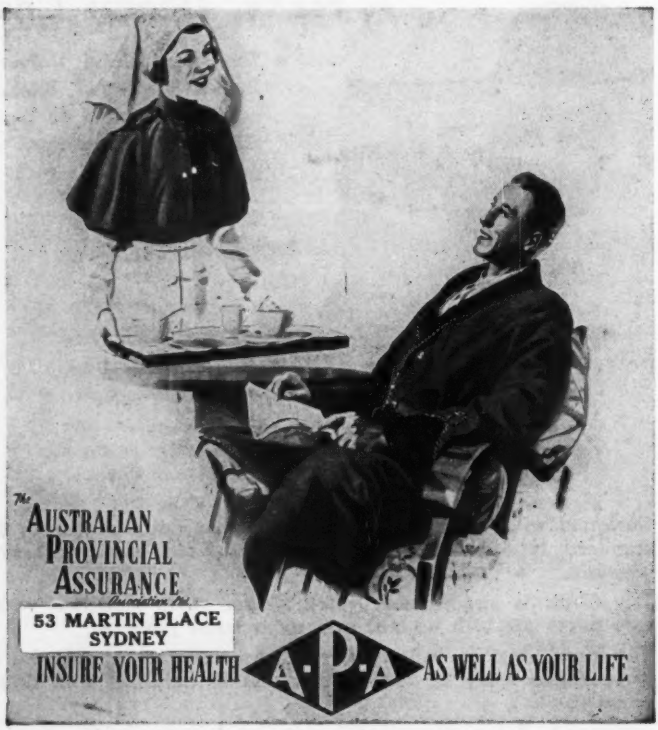

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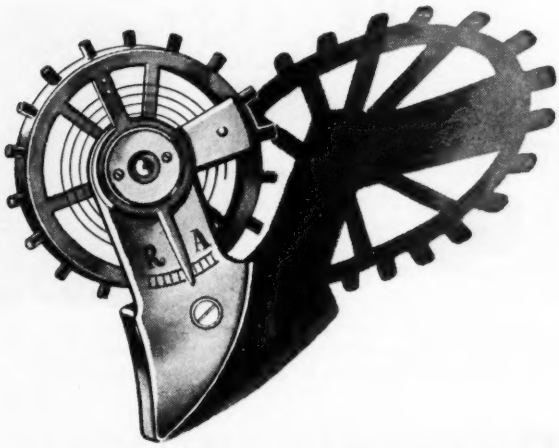

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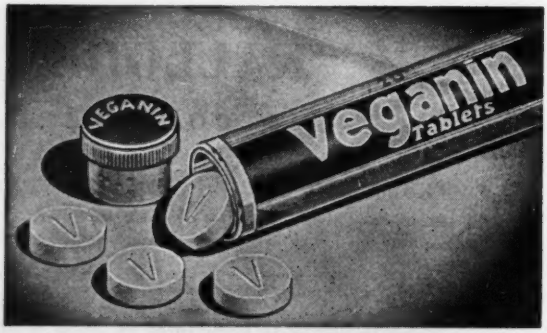

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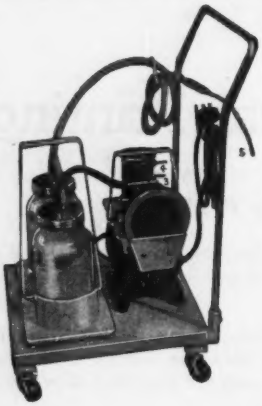

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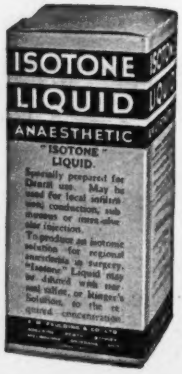

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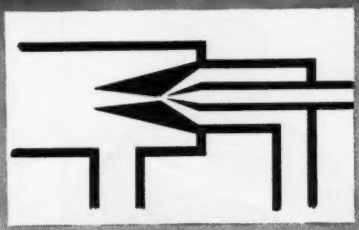

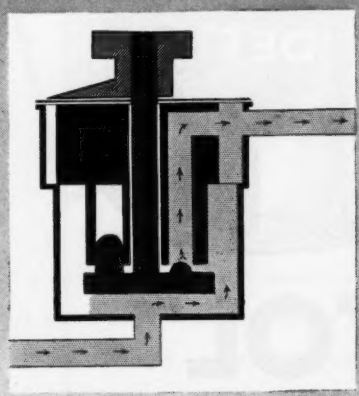

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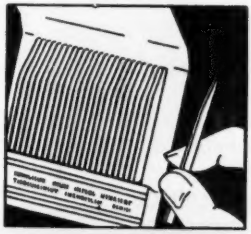
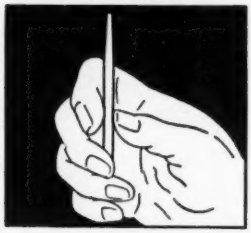
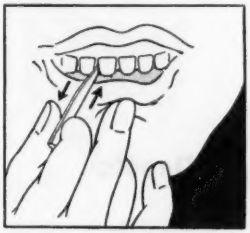


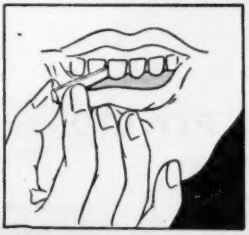
- MEDICATED GUM MASSAGERS FINISH WHAT THE TOOTHBRUSH LEAVES UNDONE.



- INDISPENSABLE FOR TREATMENT OF ALL GUM CONDITIONS.



- " INTER-DENS " ARE OBTAINABLE AT ALL CHEMISTS AND FROM DENTAL DEALERS.



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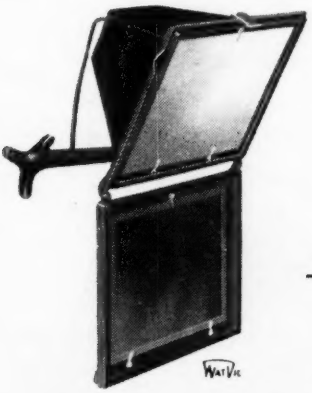

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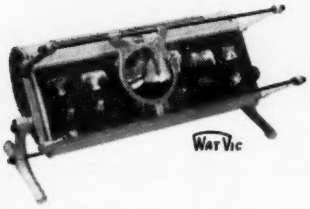

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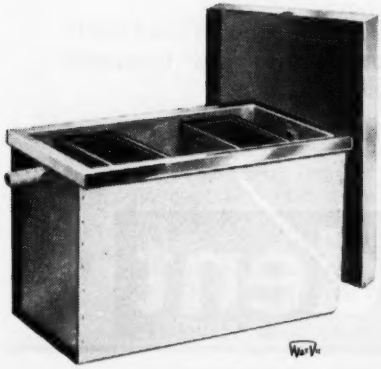

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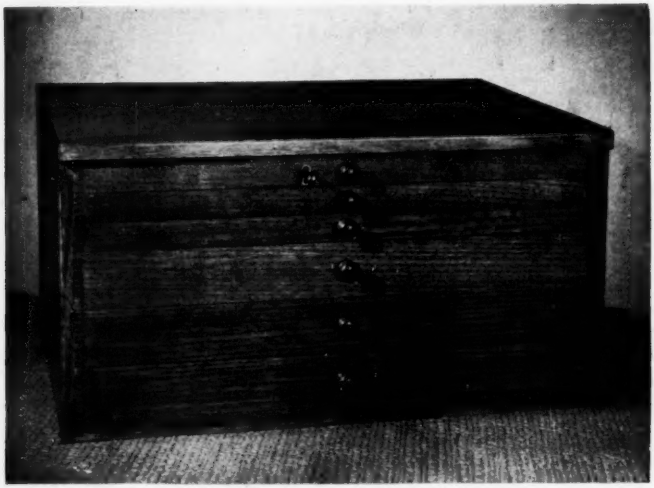

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